Gas Journal

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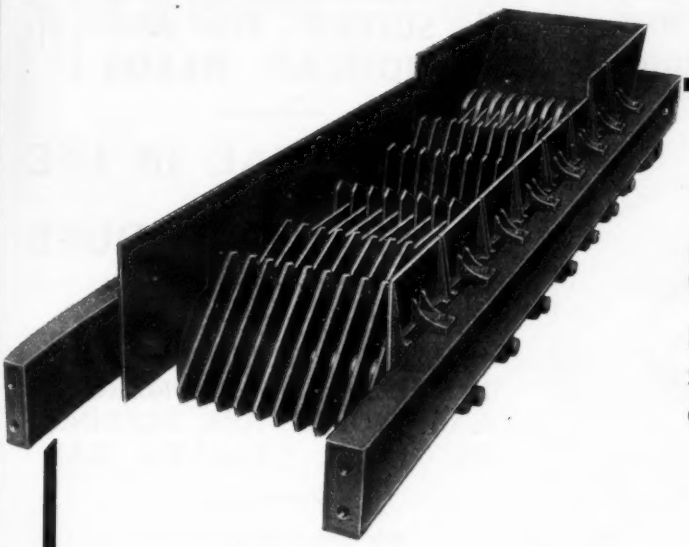

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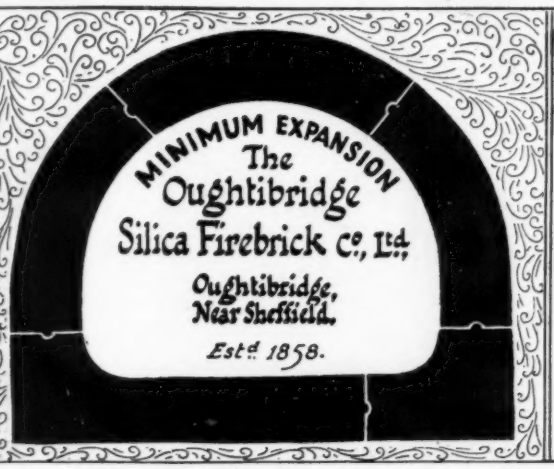

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Gas Journal

MARCH 20, 1935

Vol. 209. 87th Year No. 3748.

Editorial Notes

Gas-Minded Grouping

It is extremely satisfactory to the British Gas Industry that recent legislation has served to rid it of many of the "antiquated shackles" which in the past have hampered its progress as a public utility in a competitive field. Is it at all certain, however, that the principle of being bound with shackles was in fact so detrimental to the stability of the Industry and to the investing public's faith in its service? This reflection is set down here not because we desire by any means a return of old conditions which are not imposed on our competitors, but as a hint of the possible dangers of the newly-won freedom. The Gas Industry will always stand or fall by public opinion—the goodwill or otherwise of its millions of consumers. Obviously, then, those who are now controlling its destiny must put first and foremost the confidence of the public, a solid confidence built up by a century and a quarter's service. Anything which tends to undermine this confidence will have a swift and unpleasant reaction. By the same token those who, from without the Industry, may in the future cast covetous eyes upon the steadiness of gas supply as an investment for surplus funds, and be prepared to bid tempting prices for existing undertakings, will do well in their own interests, as well as those of the Industry in general, to give heed to the fact that so much of its success in the past may have been due to the public knowledge that shackles did exist in plenty. It all comes back once again to the "gas-mindedness" of which Sir David Milne-Watson has often spoken in this connection. If ever there is danger of this becoming a secondary consideration—well, let us turn for a moment to the American situation to-day.

We have followed, and continue to follow, with liveliest interest the welfare of the Gas Industry in the United States, and we suggest that the present position of the public utilities there holds out a lesson for us on this side. In common with gas undertakings in Great Britain they are having to face government-aided competition from electricity, and they naturally and justifiably object to paying rates and taxes part of which money is being employed to develop the force of competition. But the public utilities in the States are in a much worse position than are gas companies here, in that the belief is held in political quarters that the financial organization of the utilities has not in every instance put the consumers' interests first. We are not in the least taking sides on this matter, and it is far from our intention to become critical of the American Gas Industry, for whose general work and salesmanship there can be nothing but praise. It is a result of this feeling, however, that a "Utility Holding Bill" is now before Congress, the object of this Bill being to control, and ultimately to eliminate, the holding companies which own the companies actually managing public utilities. Mr. Roosevelt is of opinion that the way in which the practice of holding companies has developed in the States has given "a few corporate insiders unwarranted and intolerable powers over other people's money." In other words, the American Gas Industry, which has enjoyed such freedom from antiquated shackles, may in the future have to labour under the yoke of modern shackles.

As far as the British Gas Industry is concerned the holding-company movement is of recent origin but of immense popularity. In the light of American history we hope that in Great Britain this plan will in the ultimate prove just as acceptable to the gas consumer as it is at present to the promoters. If it does not so prove there may be the shadow of another shackle to depress the brightness of the gas horizon. We do not in any way belittle the advantages which can accrue from amalgamation and joint working on a large scale, but we suggest that President Roosevelt's latest move gives cause for reflection that there truly is a distinction between gas-minded and financially-minded grouping, even if, unfortunately, there is no authority which can be the supreme judge as to what is which.

"Halfpenny Electricity"

"THE optional two-part tariff system of charging for gas is a subject calling for the most careful study." This from the Address of Mr. Roberts, of Hereford, as President of the Midland Association of Gas Engineers and Managers. We should have liked the sentence very much better had he added the words "and prompt action." In our news columns to-day we quote the new electricity tariffs at Southport as an example of the type of competition which some gas undertakings are already having to face and which many more will encounter before long. Electricity at a halfpenny a unit, *with no standing*

charge, for cooking and heating certainly is competition. It can be argued with full justification that halfpenny electricity for any load is not an economic proposition, that the offer can only be made because of subsidy from a comparatively high rate charged for lighting, and that should the electrical heating load develop rapidly there would have to be an increase in the price of current. What we have to face, however, is that in the immediate present such rates, subsidized or not, are in operation. For those connected with the Gas Industry to say that halfpenny electricity simply " can't be done " does not carry much weight when it is being done. We believe that in the long run halfpenny-unit current is not feasible, but that is for the future. The Gas Industry will have to act in the light of to-day—and there is not the slightest reason to throw in the sponge. The truth of the matter is that the electrical industry has not yet felt the force of properly planned and energetic competition from gas.

Of course, electricity consumers in Southport have the option of a tariff other than the flat rate. If they pay 2s. 6d. per room per quarter in winter, then electricity is supplied for all purposes at a halfpenny a unit. We have come to the conclusion that, with halfpenny current, electric lighting is not an expensive luxury. Ah! some will say, but it is not halfpenny current. Precisely, the standing charge has to be met, and every unit consumed must bear an increment of this charge. But this argument is entirely wrong psychologically. What happens in practice is that the consumer, having paid his 2s. 6d. per room, is able to avail himself of a remarkable amount of service. From the dim gloom of a 40-watt lamp he emerges into " birthday lighting." His whole conception of the illumination service which electricity can give is altered. He becomes " electrically minded." If this is not good salesmanship, perhaps some of our readers will tell us why. And in their replies we hope they will not talk about " loaded dice " and the like. By the way, in the summer Southport consumers are charged only 2s. per room per quarter and are then supplied with current at three units a penny.

Optional Tariffs Needed

To revert to the Address by Mr. Roberts. He agrees with us that we must face this all-important tariff problem courageously, and as a start in tackling his particular problem he sets out a table giving the consumption per consumer at Hereford classified under different headings. This is a good starting point. The table shows the desirability of offering some form of tariff other than the flat rate to all consumers, and not only to ordinary consumers. At Hereford there were at the time the table was compiled 4,814 prepayment consumers, compared with only 1,930 ordinary consumers. Of this total of prepayment consumers 3,245 took less than 25,000 c.ft. per annum, the corresponding figure for ordinary consumers being 731. In other words, more than two-thirds of the prepayment consumers are taking less than 6,250 c.ft. a quarter. This indicates the need for affording the consumer greater encouragement, *via* an attractive tariff, to use more gas. So far the tariff experiments at Hereford have not been spectacular. True, there is a special water heating rate, and rebates are given to large consumers, but only 50 consumers benefit under this rebate scheme. There is plenty of scope at Hereford for an optional tariff.

We have mentioned that the electrical industry has not yet felt the force of properly planned and energetic competition from gas. Point is given to this contention by Mr. Roberts' reference to apathy within our Industry. Apathy, he believes, is our keenest competitor, and we agree. As an instance he quotes the remarks of a builder who, he suggested, should install gas fires and water heaters in the houses he was proposing to erect. The reply to this suggestion is startling: " I have been in the building trade for 37 years, and you are one of the very few gas engineers to ask me to install gas fires and hot water units." And then we talk about " loaded dice."

Within small compass Mr. Roberts covers a large amount of ground in his Address. We are glad that he shares with us a belief that selling coke is a profitable line, and we like his insistence on the value of after-sales service. Gas undertakings are well advised to abandon the idea of selling commodities and, instead, have foremost in mind the services which these commodities can give when used to the best advantage. Quite rightly Mr. Roberts concludes that money spent on his maintenance-*cum*-sales scheme is a sound investment, and he is going ahead to extend this appreciated help. We also like his policy in regard to the lighting load, both domestic and public. As for domestic lighting, he is modernizing consumers' installations at a good rate and with full satisfaction to the users. He is reinforcing his first line of defence against electrical competition. And as for public lighting, practically the whole of the City of Hereford is gas lighted.

Chemical Engineering

TIME was—and it is not so long ago—when the engineer in the Gas Industry thought very little of the chemist. In the capacity of engineer and manager he may have paid the chemist lip-service; he certainly paid him little else. It is more than fortunate for our Industry that this lack of co-operation has in recent years given place to a more general recognition, though a tardy one, that the chemist is of importance in what is so largely a chemical industry. We feel sure that mutual understanding and appreciation between chemist and engineer are essential to the prosperity of gas and its allied products, and for this reason we are exceedingly pleased that the Gas Industry is to play an important part in the Chemical Engineering Congress of the World Power Conference to be held in London in June next year.

As already announced in the " JOURNAL," the Chairman of the Organizing Committee is Sir David Milne-Watson, and the Vice-Chairman Dr. E. W. Smith, and when we turn to the constitution of the Technical Committee we find strong representation from the Gas Industry, which, of course, is as it should be, for if the gas-works process is not chemical engineering it is a very close approach to it. The preliminary programme of the Congress holds out much promise for the success of this international gathering of scientists and industrialists—a success all the more assured by the experience gained since the First World Power Conference was staged at Wembley eleven years ago. In a foreword to the programme it is stated that Chemical Engineering has now emerged as a distinct branch of the engineering profession—in no small degree due to the striking developments in the provision of new materials available for both manufacturing and constructional purposes. " There is practically no branch of industry in which the chemical engineer does not, or might not, contribute valuable assistance." Certainly this is true of the Gas Industry, which in its plant and its processes owes much to " chemical engineering."

In all the branches of Science national isolation is not regarded as being at all splendid, and we are glad that response to the invitation to this International Confer-

ence is most gratifying to its organizers. An affair of this nature is valuable in that it results in the dissemination of a great deal of information carrying the stamp of authenticity and responsibility. It is to our mind even more valuable in that it provides opportunity for workers in the same fields but in other countries to make contact in a common cause. If the merit of this cannot be expressed statistically, it is none the less for that. We look forward, *via* the 1936 Congress, to the published and unpublished views of those in this and other countries on subjects of vital interest to the Gas Industry. As indication of the subjects to be discussed we may mention the distribution of gas, manufacture of open grate fuel, blending, methods of heating carbonizing plants, low-temperature carbonization, washing and purification of gas, hydrogenation, benzole recovery, and the disposal of effluents. The " chemical engineering " view on these and other matters should prove most helpful.

The General Secretary of the Congress is Mr. M. W. Burt, recently appointed Secretary of the Society of British Gas Industries, and the International Secretary is Mr. C. H. Gray.

Shareholder Co-operation

DURING the last few months, attention has been devoted in both the editorial and the correspondence columns of the " JOURNAL " to the question of shareholder co-operation. The importance of securing this co-operation to the utmost limit is vital. Investment is a matter in regard to which one's interests and one's inclination should run on parallel lines. Those who show sufficient confidence in gas to invest money in it demonstrate their belief that they are " on a good thing," and the gas investor who makes every effort to use gas to the greatest possible extent is to that degree influencing the value of his investment. It is because of our faith in the value to the Industry of the shareholder-consumer that we welcome whole-heartedly any scheme which results in an " extension of the franchise " so as to enlarge as far as practicable the circle of gas shareholders. We are thinking for the moment, of course, of the company-owned undertakings. When it comes to the gas-works in the hands of local authorities, every consumer in a concern so owned is really in the position of a shareholder, inasmuch as he will derive benefit from success or be penalized by failure. On the same line of argument, we are in agreement with those who regret the passing to big combines, in the present wave of amalgamation and grouping, of the interests so extensively held in the past by the local shareholder-consumer.

In another connection, we recently termed " silent salesmen " those gas appliances which make appeal to the eye and to the reason. There is no need for the gas shareholder to be a " silent " salesman. On the contrary, let him talk about gas, write about gas, or even sing about gas—let him do anything, so long as he *is* a salesman. He can derive phalanxes of facts and cohorts of arguments from the reports of gas company meetings which have within recent weeks been given in our news pages.

Annual meetings, of course, are not the only means of furthering shareholder co-operation. What are termed " Year Books " can be utilized also for local and general propaganda purposes. We have drawn attention on occasion to the attractive production of this character issued annually by the Newcastle-upon-Tyne and Gateshead Gas Company, and, as a matter of fact, it is a statement in the latest edition of this Newcastle Year Book which leads us to discuss once again the question of shareholder co-operation. This statement we reproduce below, as an exhortation to gas shareholders and as a suggestion to gas undertakings who have not already extended a similar offer to their proprietors:

> About £200,000,000 of capital has been expended in the Gas Industry of this country. Of this amount, roughly £131,500,000 is represented by capital subscribed to gas companies. This vast sum is owned by thousands of individuals in every walk of life who have part or all of their savings invested in gas securities.
>
> It has been suggested that the thousands of gas stockholders throughout the country might serve their own interests and those of the Gas Industry by co-operating to a greater extent than at present by equipping their homes with modern gas labour-saving appliances, by using gas in their offices or works, and recommending its use to their various friends. A word of recommendation, here and there at the right season, to a potential gas consumer gives that " personal touch " which often produces better results than even the cleverest of Press publicity.
>
> The Company will be pleased to forward to individual shareholders, on request, illustrated literature on the modern developments of gas.

Personal

Mr. T. C. ELLACOTT, Works Chemist and Technical Assistant at the Bishop Auckland District Gas Company, has been appointed an Assistant Engineer with the Hong Kong and China Gas Company, Ltd.

* * *

Mr. GEORGE HERBERT BRADDOCK, J.P., of Oldham, gas meter manufacturer, who died on Nov. 24, aged 70, left estate of the gross value of £79,475, with net personalty £78,550. Among other bequests, he left £100 to the Benevolent Fund of the Institution of Gas Engineers, and £50 to the Charity Fund of the Northern Star Lodge of Freemasons, Manchester.

Obituary

At the Annual General Meeting of the Midland Association of Gas Engineers and Managers last Thursday, the death was reported of one of their members—Mr. H. G. HARRISON, Engineer, Manager, and Secretary of the Ashbourne Urban District Council Gas Department. The members stood for a moment in silence as a mark of respect to his memory.

* * *

The death has occurred of Mr. J. H. ELLIS, formerly Chairman and Managing Director of the Plymouth and Stonehouse Gas Company, and for a period one of the Directors of Willey & Co., Ltd.

* * *

We regret to announce the death of Mr. JOHN MOGFORD, of Oaklands, Derwen Road, Cyncoed, Cardiff. For 25 years he was Manager of the Briton Ferry (Glam.) Gas Undertaking, and later became county gas examiner. Mr. Mogford was an esteemed member of the Wales and Monmouthshire Association of Gas Engineers and Managers, having been a member since the foundation of the Association in 1905. He was elected President in 1917.

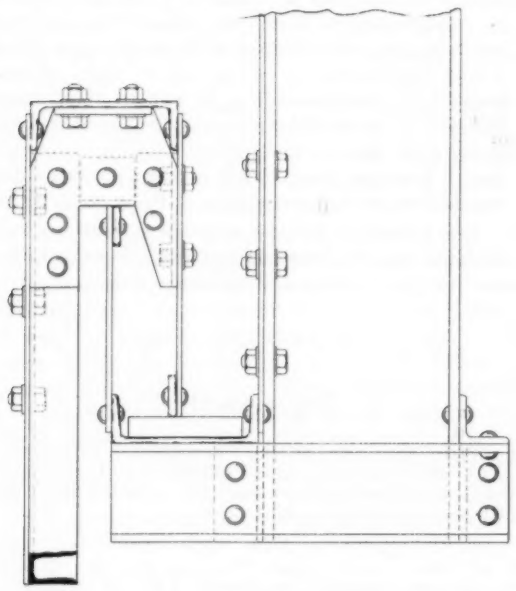
A Joint Meeting of the Yorkshire Section and the Chemical Engineering Group of the Society of Chemical Industry with the Refractories Association of Great Britain and the Refractory Materials Section of the Ceramic Society will be held in Sheffield on April 5.

Correspondence

Flooding Holes in Gasholders

SIR,—I have read with considerable interest the article in the "GAS JOURNAL" of March 6 with referepce to the methods of obtaining the position of flooding holes in gasholders. As stated by Mr. Thompson, the calculation is very difficult, but his method seems to get at the position quite readily.

For a year or two now I have given my attention to this matter, and in view of the fact that the skirting plate above the flooding holes is of very little value, it occurred to me that this plate might be shortened to the level of the intended flooding holes, thus giving additional space for the reinforcement of the channel dip.



In my experience I have come across many gasholders where the channels have been lifted out of level, due to wind pressures. Reinforcement between the gasholder shell and the skirting plate of the dip would prevent this, and some months ago I provisionally protected this method of reinforcement, which is shown on the accompanying drawing. No doubt this will be interesting to your readers who are connected with the designing of gasholders.

I am aware that the vertical stays have been bent over and secured to the channel dips for this purpose, but by the method shown an additional advantage is obtained by getting a greater depth of reinforcement down to the position where the flooding holes would ordinarily be.

In conclusion I would add that I much appreciate the article by Mr. Thompson, which clears up considerably a complicated question.

Yours, &c.,
For FIRTH, BLAKELEY, SONS, & CO., LTD.,
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March 9, 1935.

National Gas Council

Meeting of the Central Executive Board

A meeting of the Central Executive Board of the National Gas Council was held at 28, Grosvenor Gardens, London, S.W. 1, on Tuesday, March 12, 1935, at 2.30 p.m.—Sir DAVID MILNE-WATSON, President, in the Chair.

Before proceeding with the business on the Agenda, Sir David, referring to the great loss sustained by the Gas Industry in the death of Mr. J. H. Ellis, who had for many years been a Vice-Chairman of the Central Executive Board, said that Mr. Ellis would always be remembered for the vigorous way in which he championed the Gas Industry, and his memory would be cherished by his many friends throughout the country. A vote of sympathy was passed, and the Secretary was requested to convey this to the family of the late Mr. Ellis.

Parliamentary.

(*a*) *Housing Bill.*—It was reported that the amendment which has been put down on behalf of Public Utility Undertakers to Clause 13 of the Housing Bill, under which notice of all housing schemes was to be served upon Public Utility Undertakers in the area concerned, had been accepted by the Government.

It was also reported that satisfactory assurances have been obtained from the Government with regard to certain other amendments regarding the compulsory purchase of land.

The question of compensation in respect of mains and cables in highways and apparatus situated upon or contained in houses which are demolished, was still under consideration, and interviews had taken place with the Ministry of Health upon the matter. Arrangements had been made to send a deputation to the Ministry of Health with regard to the question.

(*b*) *Road and Rail Traffic Act, 1933—Statutory Rules and Orders, Goods Vehicles: Keeping of Logs.*—The new statutory Rules and Orders regarding the keeping of logs were considered, and it was felt that although these did not provide the exemption which had been desired by Public Utility Undertakers, the regulations did afford some amelioration of the existing position.

Grouping of Undertakers.—Holding Companies.—Resolutions passed by meetings of the District Executive Boards were submitted to the Board and considered.

Scottish District Board.—Proposals were submitted by the Scottish Board for the purpose of consolidating and improving the work of the National Bodies in Scotland. These proposals were approved in principle so far as the National Gas Council was concerned, and referred to a Joint Committee on which all the Bodies would be represented.

Coke Oven Gas.—It was reported that a Joint Committee had been set up between representatives of the National Association of Coke and Bye-Product Plant Owners and representatives of the National Gas Council for the purpose of exploring the position of the two Industries on questions mutually affecting both Industries.

A preliminary meeting of the Committee had taken place that day, when an outline of the proposals for discussion had been formulated.

Post Office and Explosions in Manholes.—A further interview with the Joint Sub-Committee of the National Gas Council and the Institution of Gas Engineers with the General Post Office was reported, and satisfaction was expressed at the agreement which had been arrived at between the Gas Industry and the Post Office authorities with regard to notification of gas leakages and access to Post Office manholes by employees of gas undertakings.

Gas Charges.—A draft brochure with regard to methods of charge for gas, which had been prepared at the instance of the Joint Co-ordinating Committee, was, subject to slight amendments, approved and adopted.

British Gas Federation.—Further suggested amendments to the Constitution were considered and approved.

Cook with Ease*

Reviewed by a Housewife

Miss Humphries' book, "Cook with Ease," will be invaluable to the beginner and useful to the experienced cook. Her directions for the cooking of each dish are set down in the clearest and most concise way, so that the veriest novice could find no difficulties in any of the recipes. Each step is described in order and no details of preparation are omitted. No cookery book, unless it ran into innumerable volumes, could be "complete," but I suggest that a table of the seasons for various foods might have been helpful in even this book of obviously limited compass.

Hints are given on how to choose fish, but nothing whatever is suggested on the buying of meat, poultry, or game.

The chapters on the care and use of the gas cooker and laundry made easy by gas should be both helpful and interesting. There is a table of quantities per head to allow of catering. This is not often found in a cookery book, and it ought to be a useful guide to the inexperienced shopper. There are a large number of tested recipes, all of them within the range of the housewife or plain cook. The book is well indexed.

* "Cook with Ease—The Complete Cookery Book," by Olive L. Humphries, Chief Demonstrator of the Birmingham Gas Department. Published by Cornish Brothers, Ltd., Birmingham; 3s. 6d. net.

News in Brief

Applications are Invited for the position of Manager and Secretary to the Holmfirth Gas Light Company.

Proposed New Plant at the Stockton Corporation Gas-Works includes a waste-heat boiler, a benzole recovery installation, and a gas condenser.

An Offer by the Sheffield Gas Company to purchase for £95,000 the undertaking of the Wath Bolton and Thurnscoe Joint Gas Board has been rejected.

A Visit was recently paid to the Folkestone Gas and Coke Company's Works by the members of the Folkestone and District Ironmongers' Assistants' Association.

Declaration of Calorific Value.—The St. Ives (Hunts) Gas Company, Ltd., give notice that as from June 14, 1935, they will supply gas of a calorific value of 470 B.Th.U. per c.ft.

A Broadcast on Gas.—On Tuesday next, March 26, at 10 p.m., Dr. Allan Ferguson, Assistant Professor of Physics at Queen Mary's College, is to give a fifteen minutes' talk on "Gas."

Stirling and Bridge of Allan.—The shareholders of the Stirling Gas Company have approved the draft Provisional Order for the acquisition of the Bridge of Allan Gas Department.

New Showrooms and Offices in East Princes Street, Helensburgh, are among new projects for which plans will shortly be submitted by the Helensburgh Gas Department to the local Dean of Guild Court.

The Eastern Counties Gas Managers' Association are holding their Spring Meeting at Stamford on May 15-16 next under the Presidency of Mr. B. Clarke, Engineer and Manager of the Stamford and St. Martin's Gas Light and Coke Company.

A Distribution Superintendent is required by the Smethwick Gas Department. Further particulars concerning the position will be found in our advertisement columns this week. The salary commences at £450, rising by increments to £500.

An Optional Two-Part Tariff Scheme for domestic purposes with a fixed charge based on rateable value and with gas at 3d. a therm has been adopted by the Dewsbury Gas Committee on the recommendation of the Gas Engineer, Mr. H. L. Bateman.

Southern Association of Gas Engineers and Managers are holding their Annual Meeting on Thursday, March 28, at the Hotel Metropole, Northumberland Avenue, W.C. 2. Luncheon will be served at the Hotel at one o'clock and the chair will be taken at 2.30 p.m.

The Final Lecture to the Outdoor Staff of the Sheffield Gas Company was held at the chief Showrooms, 15-17, High Street, Sheffield, on Friday, March 15. On this occasion the Lecture was delivered by Mr. C. V. Collins, Gas Liaison Officer of Electrolux, Ltd., on "Gas Refrigeration."

Applications are Invited by the Newark-on-Trent Gas Department for the position of Engineer and Manager. The position carries with it a salary of £500 per annum, rising by annual increments of £25 to £650 per annum. Further particulars will be found in the advertisement columns of this issue.

A Booklet, containing helpful hints and a summary of the lectures given to the business girls of Newcastle-on-Tyne, has kindly been forwarded to us by the Secretary of the Newcastle-on-Tyne and Gateshead Gas Company. On the completion of the course, 400 girls were presented with a copy of this booklet.

The Institution of Chemical Engineers has arranged a joint meeting with the Manchester Metallurgical Society, to take place in Manchester on Friday, March 29. A visit will be made to the Partington Works of the Manchester Gas Department, and there will be a Paper on "Materials of Construction" by Mr. J. McKillop.

A Change-Over from Coal to Gas is to take place at the Berkeley Hotel. The management have ordered from Messrs. Benham & Sons, Ltd., 66, Wigmore Street, W. 1, a large central range 17 ft. 3 in. long by 5 ft. 6 in. wide. The range has four 24-in. and six 30-in. ovens and the whole of the top is being fitted with the special chef's burner as displayed by the Gas Light and Coke Company at the recent Food and Cookery Exhibition. This burner gives a very powerful concentrated heat and, before ordering the large range, the Berkeley Hotel had a 2-oven range fitted with these burners on trial.

"Coal in the New Era."—This book by Ivor Thomas, published last year, was reviewed in the "JOURNAL" for March 7, 1934. The book has proved so popular that the publishers, Putnam & Co., Ltd., have found it necessary to reprint, and the author has taken advantage of this to revise the work and bring it thoroughly up to date.

A Big Water Heating Push is being undertaken by the Croydon Gas Company who have recently issued attractive circulars which are being sent out with the house examiner's call. These are to be followed up personally in all cases where it is known that there is no supplementary gas water heater to the coke boiler for summer-time use.

Jubilee Floodlighting at Leamington is to be carried out on a large scale and the Leamington Priors Gas Company has undertaken to floodlight the Pump Room, the waterfall at Mill Bridge, and the old Hitchman Fountain which is again being brought into commission. The lamp standards in the town will be artistically adorned with garlands and flags.

Cheaper Gas for Lanarkshire.—The Gas Committee of Lanark County Council have reduced the price of gas used by certain firms in order to encourage trade in Lanarkshire. In most cases the reduction is from 2s. 9d. per 1,000 c.ft. to 2s. 6d., and no restrictions have been put on this new agreement, which will thus enable firms to use small quantities of gas if so desired.

"Gas—A National Industry" was the subject of an address recently delivered by Mr. G. le B. Diamond, Engineer and General Manager of the Folkestone Gas and Coke Company, before the members of the Hythe Chamber of Commerce. In proposing the vote of thanks to Mr. Diamond, Mr. J. E. Chapple said it was the most interesting address the Chamber had ever listened to.

Alteration of Declared Calorific Value.—Notice is given that, as from July 1, 1935, the calorific value of the gas to be supplied by the Yorktown (Camberley) and District Gas and Electricity Company within the "Henley limits" of the Company as defined by the Yorktown (Camberley) and District Gas and Electricity Order, 1930, will be 450 B.Th.U. in lieu of 500 B.Th.U. per c.ft.

An Order for Two Sets of vertical enclosed type gas compressors, each capable of delivering 3 million c.ft. of gas per day, has been placed with Messrs. George Waller & Son, Ltd., Gas and Hydraulic Engineers, Phœnix Iron Works, Stroud, Gloucestershire, by the Shelton Coal, Iron, and Steel Company in connection with the scheme for supplying coke oven gas to the Stoke and Potteries District Gas Undertaking.

The Australian Gas Light Company.—The general meeting of the proprietors was held at King's Hall, 69, Hunter Street, Sydney, on Feb. 14. The net profits for the half-year ended Dec. 31, 1934, including the balance brought forward, amount to £211,934. The Directors recommended the payment of a dividend for the half-year of 3% on the "A" and "B" shares, which will absorb a sum of £123,300, leaving a balance to be carried forward of £88,634.

Successful Cookery Demonstrations have been held by the Truro Gas Company in conjunction with the Parkinson Stove Company, Ltd. Over 800 people attended the demonstrations. The various appliances were shown in natural settings in a series of rooms along one side of the Hall. Cookery lectures were given by Miss Helen Crawford-Fox, M.C.A., A.T.C.L., of the Parkinson Stove Company, Ltd., who also acted as judge in a cake-baking competition which provided a very satisfactory number of entries.

Colonial Gas Association Interim Dividends were declared for the half-year ended Dec. 31 last, at the rate of 4%, less income-tax, on the preference shares, and at the rate of 3%, less income-tax, on the ordinary shares. Exchange will be deducted from these dividends at the rate ruling on the date the dividend was declared—viz., £100 in London for £125 10s. in Melbourne. The dividends due to shareholders on the London Register will be payable in London on April 4 next, but where instructions to that effect have already been given to the Association, the dividends due to such shareholders will be paid in Australia to a bank there on their behalf, or to an accredited agent. It is not necessary to renew such instructions, the dividend being paid in accordance with such instructions until further notice is given by such shareholders.

A Record Year for the Lea Bridge District Gas Company is the heading of a leaflet recently issued by that Undertaking to its consumers. A total of 43,784 consumers in this area, it is stated, use gas for lighting, heating, cooking, and washing. Further figures indicate an increase in gas sold amounting to 25 million c.ft., coke sold 4,125 tons more, 867 new consumers, and net increases of 1,084 cookers and 1,180 fires. An excellent piece of publicity.

The Tenders for New Capital which Messrs. A. & W. Richards, 37, Walbrook, E.C. 4, had offered for the Directors of the South Bank and Normanby Gas Company, Ltd., were opened on March 14. The £15,000 4% redeemable mortgage debentures were allotted at prices ranging from £103 per hundred down to the minimum of par, the average price realized being £100 17s.%. The 3,000 £5 4½% preference shares were allotted at prices ranging from £5 10s. to the minimum of £5 per share, the average price realized being £5 1s. 2d. per share.

Messrs. Gibbons (Dudley), Ltd., show a net profit for the year, after providing for depreciation, of £12,746, which, added to the amount brought forward from last year, £10,195, makes a total of £22,941. From this amount the full 7% preference dividend, free of income-tax, for the year was paid on June 30 and Dec. 31, 1934, absorbing £2,100, leaving a balance of £20,841 to be now dealt with. The Directors recommend a dividend of 8% on the ordinary shares, less income-tax, be paid, absorbing £8,292, further Directors' fees of £450, leaving £12,099 to be carried forward to next year.

A Special Display was featured by the Parkinson Stove Company, Ltd., at the Royal Academy British Art in Industry Exhibition from March 4 to 9. In order to conform with conditions laid down by the Royal Academy, the name of the manufacturer was omitted from the display, but a representative range of appliances made by the Parkinson Stove Company, Ltd., was incorporated. A large chromium-plated palette surrounding a coloured enamel Calthorpe cooker had spots of paint depicted by coloured transparencies, illuminated from beneath. The colour of three of these transparencies was effectively radiated to the slogan, "Industrial Art," by means of corded silk, the lettering being aerographed in graded tones. Spot lighting was directed on to the cooker and palette.

Association of Public Lighting Engineers

The following have been received into membership of the Association of Public Lighting Engineers:

C. Valon Bennett (Rochester, President of the Institution of Gas Engineers).
E. Astbury (Liverpool).
A. E. Ames (Burnley).
B. J. Bell (Cardiff).
J. H. Hornby (Maidstone).
D. T. Livesey (Doncaster).
F. C. Matthews (Chertsey).
R. F. Smallbone (Broadstairs).
T. Thornton (Rowley Regis and Blackheath).
R. H. McGregor (Whitwick).
Robert Watson (late of Doncaster) made an Associate Member on retiring from membership, the Council recognizing the keen interest Mr. Watson continues to take in public lighting.

More Hot Water

Will Gas Gain the Load?

The problem of estimating hot water requirements is not simplified by the wide diversity in sizes of bath, and for this reason we welcomed a few months ago a new series of standard baths advocated by the International Bath Association—a body not trading for profit, but the "voice" of the majority of bath manufacturers. One of these baths has been specially devised for housing schemes and small houses generally. Although the effective length of this "artisan" bath is greater, it uses less water—an important feature for the gas salesman. The adoption of the new bath would help in estimating for hot water requirements and its capacity would still further favour the use of gas.

Last week we had the opportunity of inspecting another type of bath advocated by the Association. This is a "Five-Purpose" bath and is intended to provide hot baths in the poorest houses without the necessity for having separate bathroom accommodation. The functions of the bath, combined in one piece of equipment, are bathing, wash basin for hand use or light laundry work, kitchen sink with draining board, home laundry equipped with rubbing board and wringer, and a strong table for meals or general use. The full dimensions of this composite equipment are 4 ft. 2 in. by 2 ft. 9½ in. wide, and 30½ in. high.

It is estimated that in some towns 50% of the houses are not only without bathrooms, but without baths, so that the potential field for an appliance of this kind, which is actually a space saver, is great. Its installation would increase the demand for hot water, and it is therefore of direct interest to the Gas Industry. The new bath will be shown to the public for the first time at the *Daily Mail* Ideal Home Exhibition, Olympia, March 26-April 18.

Amalgamation and Grouping

Severn Valley and Tenbury.

The Severn Valley Gas Corporation, Ltd., announce that their recent offer to the shareholders of the Tenbury Union Gas Company, Ltd., has been accepted by holders of over 95% of the shares of that Company.

Wandsworth and District Goas Cmpany.

Negotiations are proceeding for the acquisition by the Wandsworth and District Gas Company of the Leatherhead Gas and Lighting Company.

Forthcoming Engagements

March.

21.—I.G.E.—Refractory Materials Joint Committee, 2.30 p.m.
21.—Society of British Gas Industries.—Council Meeting at 56, Victoria Street, 11 a.m.
22.—Southern Association (Eastern District).—Meeting at 28, Grosvenor Gardens, 2.30 p.m.
22.—Manchester District Association. — Annual Luncheon, Midland Hotel, Manchester, 1 p.m., followed by the Annual Meeting, 2.30 p.m.
23.—Scottish Junior Association (Western District).—Annual Business Meeting. Paper by Mr. J. L. Crossley.
25.—Gas Companies' Protection Association.—Committee Meeting at 5, Victoria Street, S.W. 1, 2.30 p.m.
27.—B.C.G.A.—Annual Meeting of Members in Scotland; North British Hotel, Edinburgh, 2.30 p.m.
28.—Southern Association.—Annual General Meeting, Hotel Metropole, London. Presidential Address of Mr. E. L. Nicholas, of Guildford.
29.—I.G.E.—Joint Lighting Committee, 2.30 p.m.

April.

2.—I.G.E.—Research Executive Committee, 2.30 p.m.
4.—B.C.G.A.—Eastern District Meeting, Peterborough.
4.—Midland Junior Association.—Meeting and Paper by Mr. Leonard Bott.
5.—North British Association.—Spring Meeting at Dunfermline.
5.—B.C.G.A.—Annual Meeting of Gas Salesmen's Circles, Caxton Hall, S.W. 1.
6.—Manchester and District Junior Association.—Meeting at Manchester. Paper by Mr. H. Partington.
8.—I.G.E.—Finance Sub-Committee, 1.45 p.m.
8.—I.G.E.—Membership Sub-Committee, 2.30 p.m.
8.—I.G.E.—General Purposes Committee, 3.15 p.m.
8.—I.G.E.—Benevolent Fund Committee of Management, 4.30 p.m.
9.—I.G.E.—Council Meeting, 10 a.m.
9.—I.G.E.—Education Committee, 4 p.m.
10.—I.G.E.—Education Executive Committee, 10 a.m.
13.—Scottish Junior Association (Eastern District).—Visit to Kirkcaldy. Paper by Mr. J. M. Dow.
13.—Yorkshire Junior Association.—Meeting at Bradford. Paper by Dr. H. A. Fells.
27.—I.G.E.—Examinations in Gas Engineering.

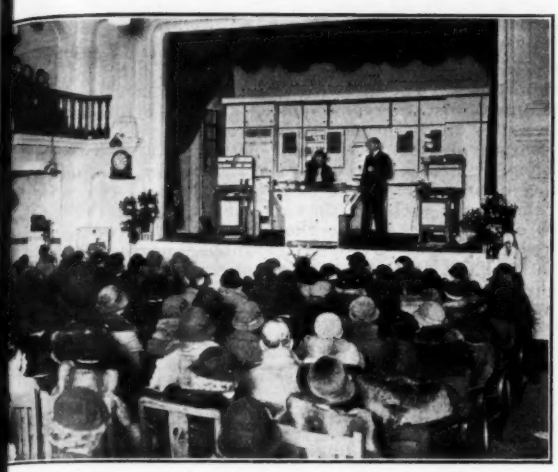
May

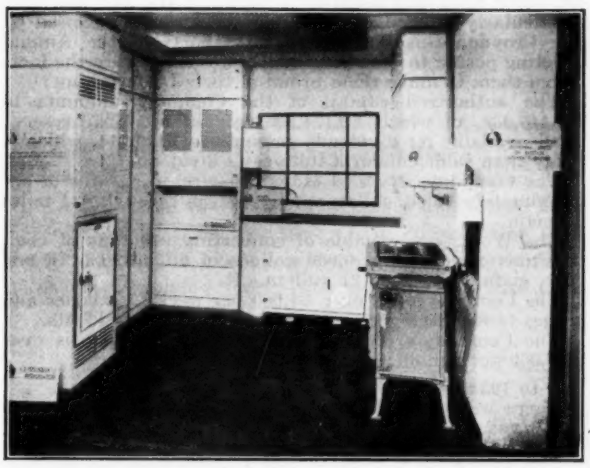
3.—Wales and Mon. Junior Gas Association.—Annual General Meeting at Cardiff, 6.45 p.m.
4.—I.G.E.—Examinations in Gas Supply.
15-16.—Eastern Counties Gas Managers' Association.—Spring Meeting at Stamford.
16.—Midland Association.—Visit to Hereford.

June

4-7.—I.G.E.—Annual General Meeting in London.

"Good Housekeeping—Better Cooking"





The Folkestone Gas and Coke Company, in collaboration with the British Commercial Gas Association, are holding a very successful exhibition at the Leas Pavilion, Folkestone. The theme of the exhibition is "Good Housekeeping—Better Cooking," and Mr. G. le B. Diamond, Engineer and Manager of the Company, realizing that the days of the old "Gas Exhibition" are dead, set out to plan an exhibition that would appeal to every section of the community, the utmost consideration being given to service and sales promotion. Gas lighting is given a great deal of prominence and liberal use is made of the most up-to-date fittings and equipment through the co-operation of Messrs. Sugg, Evered, and Falk, Stadelmann. The general effect of the Hall lighting is magnificent and has called for favourable comment. Cookery demonstrations, given by Miss Baker, of Radiation, Ltd., are being well attended.

The whole of the stands and general fitments are carried out in a colour scheme of jade green and cream. These colours lend themselves particularly well to the corner displays of a modern lounge. In order to secure uniformity and continuity, the stands allotted to Messrs. Richmonds were designed and constructed to meet with the general scheme.

A "chef" of modern design and treatment was created by the B.C.G.A. studios, and this is used, coupled with the slogan "Good Housekeeping—Better Cooking," as the keynote throughout the whole campaign. 150 posters appeared on the hoardings and front pages of local newspapers and magazines were taken up. Every showcard used in the exhibition is carried out in a standard design bearing the chef symbol.

Our illustrations show Mr. G. le B. Diamond introducing Mrs. D. D. Cottington-Taylor, Director of the Good Housekeeping Institute, who opened the exhibition, and the Peerless kitchen. The Peerless Kitchen Cabinet Company, Greenford, Middlesex, also transformed the stage into a magnificent working kitchen.

Competition is Growing

Southport provides a good example of what gas undertakings either have to face now or are likely to encounter before long. "All Hail Electricity!" is Southport's motto. The Electricity Department there have reduced the heating flat rate, which includes cooking, to ½d. a unit. No other standing charge whatever is made on this scale, and where more than one meter is fixed for any independent consumer and premises a charge is made for one meter only. So Southport can talk with justification of halfpenny electricity for heating and cooking.

Alternative to the flat rate is a Domestic Tariff. Under this scheme there is a fixed charge per room of 2s. 6d. per quarter in winter, with a unit charge of ½d. In summer 2s. per room per quarter is charged, and electricity is then supplied at 3 units for 1d.

Such competition appears to support our view that gas undertakings might do worse than adopt attractive tariffs alternative to the flat rate charge.

A Tribute to Leeds Training

A splendid tribute to the part played by the University of Leeds in helping the progress of the Gas Industry was paid by Mr. Hardie, Chief Engineer of the Gas Light and Coke Company, on Friday last. The occasion was the informal dinner of the Department of Coal Gas and Fuel Industries, when staff and old and present students met in friendship. As guest of honour Mr. Hardie spoke of the debt which the Industry owes to the Department, and in particular he referred to the work of Prof. Smithells and Prof. Cobb, the value of which, he said, cannot be over-estimated. Men trained in the University and the Department were occupying a variety of positions in the Gas Industry, and it was significant of the value placed upon this training that every student who passed out of the Department last year had received an appointment.

Gas-works plant, continued Mr. Hardie, was now much more complicated than formerly, and required skilled supervision to ensure the greatest efficiency. In his own Company during the past fifteen years the labour employed for gas-making had been reduced by 50%; at the same time the staff had almost doubled. On the works and on the district there were plenty of openings for technically trained men, and in catering for the demand the Fuel Department at Leeds University was carrying out an excellent service.

A Mobile Display Unit

Here is the new mobile showroom of the Plymouth and Stonehouse Gas Light and Coke Company, who acquired a 32-seater single-deck omnibus and converted it to excellent effect as our photograph shows. The Sales and Technical Departments of the Undertaking are to be congratulated on the result of their combined efforts.

Making Stockholders Gas-Minded

Gas-mindedness in stockholders, as well as employees, is greatly to be desired, as the "JOURNAL" has emphasized on more than one occasion recently. We are therefore particularly interested in a single-sheet leaflet enclosed by the Croydon Gas Company with reports of the Annual Meeting posted to their shareholders. These were the facts given them to make them proud of their Undertaking:

The authorized capital of the Company amounts to £2,446,538, of which £2,174,835 is paid up. The reserve fund available for dividends amounts to £120,014, which is more than sufficient for a full year's dividend.

The Company serves 94,415 consumers, in an area of approximately 73 sq. miles, supplying gas through 541 miles of main.

The Works are capable of converting 970 tons of coal, 120 tons of coke, and 9,000 gallons of oil into gas in one day, giving a yield of 21 million c.ft.

The Company pays over £4,000 per week in salaries and wages to its employees, all of whom are local residents.

The Company's contribution to the local rates is over £30,000 per annum.

In 1934—

There were an additional 4,827 customers supplied with gas.

The length of mains laid was 33 miles.

The number of consumers' orders dealt with was 194,114.

The value of the appliances sold was £89,923.

The number of cookers supplied was 18,845.

The number of fires supplied was 8,078.

The number of appliances overhauled and repaired at the William Cash workshops was 9,429.

The number of new houses piped for gas appliances was 4,730, aggregating 26,350 gas points.

There were 145 miles of gas pipes used for connecting appliances.

There were 87 cookery demonstrations, given to approximately 4,908 people.

The Company's instructional cinema film was shown to over 3,000 people.

Charging for Bottled Gas Supplies

In a recent issue ("JOURNAL" for Feb. 13) details were given of the gas compressing station which has been established at the Perrache Gas-Works at Lyons, France, to meet the increasing demand for "bottled gas" for the running of the engines of industrial motor vehicles. The Chief Engineer, M. G. Venot, of the Compagnie du Gaz de Lyons, has devoted considerable time to the new development, from both the suppliers' and the users' points of view; and in *Metaux et Machines* gives particulars of the methods he has adopted for charging for supplies of compressed gas.

In general these are based on the Mariotte law and the use of steel cylinders of a standard size—usually of a water capacity of 48 litres (approximately 10½ gallons) which is stamped on the cylinders. As was mentioned in our previous article, the arrangements at the Perrache Station are such that gas-driven vehicles can be re-fuelled with the gas-holding cylinders *in situ*. So, taking as an example a motor lorry with eight such cylinders, arriving for a fresh supply of gas, an inspection of their gauges may show that they still contain gas, but that the pressure has dropped from the requisite 200 atmospheres to 50; in other words, that they are only one-quarter full.

A simple calculation shows that when the cylinders are fully re-charged the amount of gas supplied is represented in litres by $B \times C (P^1 - P^2)$, in which B represents the number of cylinders, C the water capacity of each cylinder, P^1 the total pressure in atmospheres, and P^2 the pressure in atmospheres in the cylinders before re-charging was commenced. Thus, in the example, the letters of the formula become converted into figures as $8 \times 48 (200 - 50) = 57{,}600$ litres.

M. Venot points out, however, that having regard to the celerity with which the re-fuelling operation is carried out —about ten minutes—a considerable heating of the supplied gas takes place, and so gives rise to an error in the formula which acts against the customer. As a result of exhaustive experiments, M. Venot has found that, to give reasonably accurate results, the value of $P^1 - P^2$ should be reduced by 15% so that the formula he now uses is:

$$B \times C (P^1 - P^2) \frac{85}{100} = \text{total litres.}$$

He agrees that even with this formula there is a slight loss in summer and a gain in winter, but the formula is being adhered to, in that it gives satisfactory results to both suppliers and users. For one thing the account for the gas supplied is only sent out at the end of the month, while, again, the customer pays only after, and not as usual before, using the gas; he also effects economy in not having to lay in stocks of fuel, or money for providing accommodation for such stock, reduced insurance, &c.

M. Venot's experience of supplying bottled gas has also revealed certain technical details that are not without importance. The pressure gauges used at the Perrache compressor station and on the storage cylinders register pressures up to 300 atmospheres, which he states give fairly accurate pressure indications between 150 and 230 atmospheres. Below 150 atmospheres, however, the indications may be incorrect to the extent of from 5 to 10%, an error which is not without effect on the P^2 item of the formula. To obviate this, on the charging platform two additional pressure gauges have been mounted, one recording up to 100 and the other to 50 atmospheres by means of which, when a vehicle arrives for re-fuelling, the existing pressure in its gas cylinders is first checked and recorded before re-charging is commenced.

Gas Retained and Electricity Displaced

Maldon's Improved Street Lighting

Until the present lighting season the public lighting of Maldon, Essex, was partly by gas and, on the outskirts of the town, by electricity. The Council recently decided to place one contract only for the lighting of the streets throughout the area—either all gas or all electricity, and quotations were asked from both supply Companies. The Maldon Gas Light Company were faced with the problem of having no mains in about three miles of roads, some of which had previously been lighted by electricity. The Company decided to make every effort to retain the business, and to face the responsibility of putting down the required mains. A quotation was duly submitted for the lighting of the whole area, including the improvement of the lamps in the main street and the provision of some 40 additional lamps on the route of the proposed new main.

The Company proposed to erect 26 new steel standards in the main street, carrying 5-light "Rochester" lamps on 7-ft. extension arms and fitted with Horstmann clock controllers and multi-ray reflectors. The clearance under the lamps was to be 18 ft.

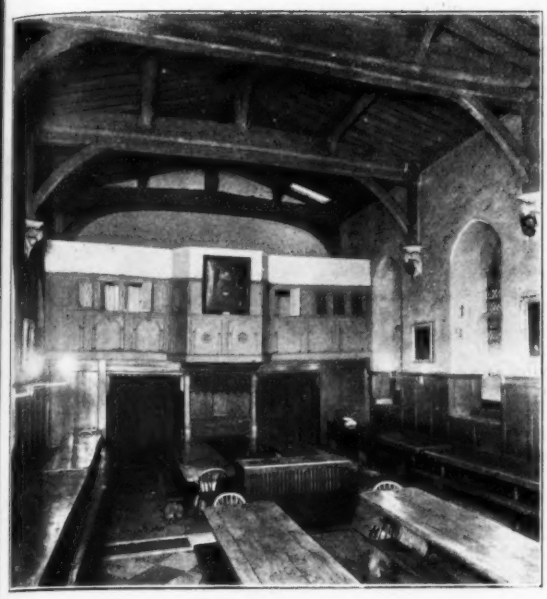
The Council called a special meeting and invited representatives of both the Gas and Electricity Companies to attend and to put the case for their respective commodities. All details were very carefully examined, and the Council finally decided to place a seven years' contract with the Gas Company for the whole lighting.

Within a few weeks the new lamps were put up and lighted and received much favourable comment from the townspeople.

The Maldon Gas Company is a subsidiary of the British Gas Light Company, and it is because it had the bigger Undertaking behind it that the large outlay, which in time will certainly be remunerative, could be undertaken. Maldon is a small town of 6,500 inhabitants, but the lighting of its main street can now bear comparison with the best modern low-pressure street lighting.

Gas-Fired Central Heating OF Historic Hall

Specialized skill and attention is called for in the work of installing Central Heating in a Building with such historical associations as College Hall at Westminster School, and the firm of Thomas Potterton (Heating Engineers), Ltd., Cavendish Works, Balham, S.W. 12, in collaboration with the Gas Light and Coke Company, are to be congratulated on having completed such a task with success both from the aesthetical and practical standpoints.



The 14th Century College Hall.

College Hall at Westminster School, formerly used by the Abbots of Westminster and still in possession of the Dean and Chapter of Westminster Abbey, though assigned by Act of Parliament for the use of the King's Scholars of Westminster School as their Dining Hall, dates back to 1369-1376 and has great historical associations. It was in this hall that Elizabeth Woodville, who had taken refuge in the Abbot's House about 1483, was persuaded to part with her younger son Richard, Duke of York, so that he might join his brother Edward V. in the Tower of London where they were both subsequently murdered.

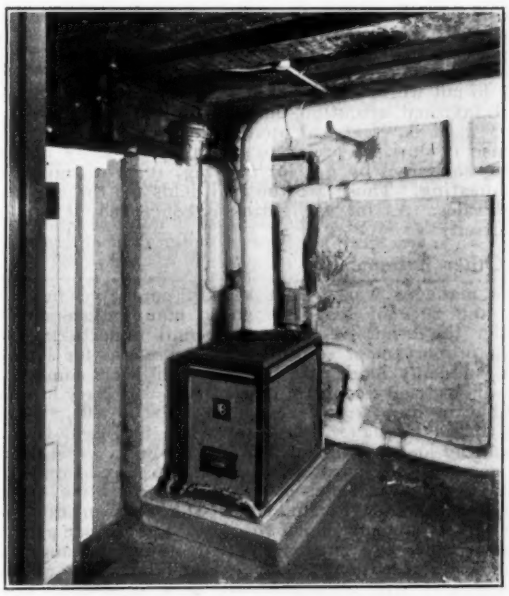
The Hall, which is 50 ft. long by 25 ft. wide, has four bays with a dais at one end. The low-pitched roof is carried on trusses and, although it was restored by the great architect Wren, essentially it remains unaltered. In 1733 the Hall was beautified and to this period belong the stone lozenged paving and panelling behind the high table. On the walls are frescoes of the arms of Westminster, Christ Church, Trinity, and of the Order of the Bath, all being in an excellent state of perservation.

Naturally the installation of modern methods of central heating in so historic a building was a matter which required very careful consideration by the architect, Mr. A. L. N. Russell, F.R.I.B.A., 4N, Lower Belgrave Street, Victoria, S.W. 1. Until 1847 there existed a hearth for an open fire in the centre of the Hall, the smoke escaping through the louvre which still exists but has been closed since the adoption of more modern methods.

A primary consideration was the question of fuel, and gas was chosen on the counts of cleanliness and ease of control. After a calculation of heat losses through the building and making all due allowances, it was found that a heating surface of 500 sq. ft. would be required to maintain an even temperature of 60° F. throughout the Hall.

The installation of modern radiators in such surroundings without making too marked a contrast and, at the same time not unduly reducing the heat radiation, was the next problem, and it was solved in the manner shown by our illustrations.

Two large radiators are fitted in the centre of the Hall where an old coal-burning stove with a descending flue



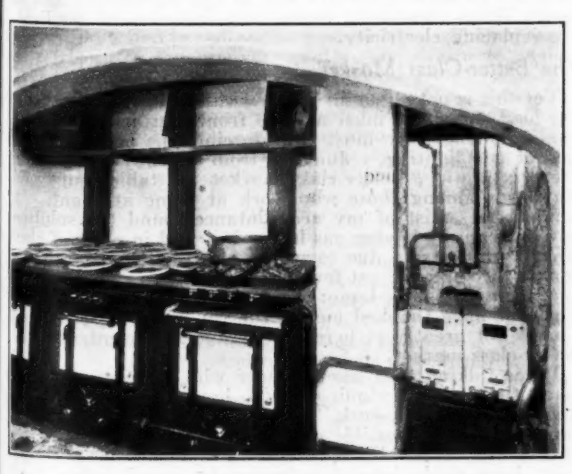
Gas-Fired Central Heating Boiler.

previously stood. These two radiators present a total heating surface of 220 sq. ft., and are enclosed in a specially made casing with a maximum amount of free air space. The top of this casing forms a table upon which a grill is fixed for the boys to make toast. The remainder of the radiators are fitted around the walls where they are effective without being too conspicuous. The lobby at the entrance to the Hall is also provided with two radiators to obviate any draughts.

The temperature of the Hall is controlled by an air thermostat situated in the Minstrel Gallery. This thermostat is set to maintain a steady temperature of 60° F. Attached to the air thermostat is a clock controller which at predetermined times opens the gas valve in the morning and closes it at night.

The Potterton "Rex" gas-fired boiler used in this plant is situated in the basement, adjacent to the larder, and so well insulated is the heating system that the larder remains stone-cold while the boiler is operating. The lagging of the system was carried out with plastic asbestos compound with an intervening layer of magnesia. A good finish was obtained by skilful trowelling and varnishing.

The boiler is fitted with a water thermostat which con-



The Hot Water Supply Boilers Alongside a Benham Gas Range.

trols the temperature of the circulating water within suitable limits. The system is rendered fool-proof by the use of both air and water thermostats since, if anyone should adjust the air thermostat to a temperature which would cause boiling, the water thermostat will cut down the gas supply and so prevent overheating.

The whole of the kitchen equipment has been modernized, and in place of a coal-burning range, there has been fitted a large gas range manufactured by Benham & Sons, Ltd. Stainless steel sinks have been provided, and the considerable demand for hot water is met by two Potterton "Emperor" gas water heaters with a high-temperature output of 74 gallons per hour. The water heaters work in conjunction with a storage cylinder of 150 gallons capacity. The position of this storage had to be very carefully arranged in order to avoid obstructing the view of one of the oldest ingle nooks in the country.

Many difficulties beset the engineers in the task of completing a successful central heating installation in such an old-world building. Not least of these was the execution of the work in connection with the cutting away of the walls which were nearly 5 ft. thick in places.

UNDER THE LENS

By Quidnunc

The Truth About Gas Lighting

The Fat Boy in *Pickwick* has worthy successors in the modern Gas Industry. They are the gentlemen who try to make our flesh creep by asserting that the loss of the lighting load would be the death-sentence of the Gas Industry. This is simply not true. Everyone knows of countries where gas lighting has virtually disappeared, and a gas lamp is a curiosity. Yet the gas men in those unhappy countries blithely score new records every year, seemingly unconscious of the fact that their Industry has been doomed to extinction by gloomy prophets in England. In America, for instance, where the enterprise of electricians far transcends any competition we have so far met, there is no evidence that the Gas Industry has been crippled by the universal adoption of electric lighting.

How much of the lip-service which is paid by gas men to the merits of gas light is backed up by vigorous and well-conceived campaigns to preserve the lighting load? I put the question to a manager whose company has an astonishing record of progress.

"I do not worry much about the lighting load," he said. "If I lavished attention on it, I would not increase it much; as it is, electrical apathy ensures that the rate of decrease is slow. I prefer to put all my energy into displacing solid fuel by gas for cooking, room-warming, and water-heating. Those are the real fields for the expansion of gas sales. As far as lighting is concerned, it can look after itself."

The Other Extreme.

This manager works in a thickly populated industrial area, and 20% of his sales go to manufacturers. Now consider the other extreme—the small undertaking with a high proportion of consumers who use gas for lighting, which suddenly finds itself faced with keen competition from an electricity concern offering comparatively low rates for lighting and an attractive two-part tariff. In such cases the gas manager has no option but to fight hard for his lighting load. What measures shall he take? My own impression is that most managers in this predicament immediately issue a leaflet giving the comparative costs of gas and electricity for lighting. I have seen dozens of these leaflets, but not one of them could have been expected to cut ice, because they are based on false assumptions. In the first place, the manager assumes that every recipient of the leaflet will wade through the comparative figures assembled therein, and draw the desired conclusion. What sublime optimism! Gratuitous leaflets with rows of figures are not popular, even with readers of catholic tastes; and the sort of "comparative costs" which appear in advertising literature are suspect to the most innocent people. In addition, such of these leaflets as I have come across are at best homely in appearance. At worst, they are downright repulsive—a thoroughly bad advertisement of any company's service.

But the second assumption is even less defensible. It is that the only real advantage of gas lighting over electric lighting is cheapness. Generally speaking, gas lighting *is* far cheaper than electric lighting, though in some few districts, even if we assume that one therm is equal to six units for lighting purposes, the margin is small. And, of course, it is sound selling policy to list cheapness among the qualities of gas lighting. But to lay all the emphasis on cheapness is the policy of the self-confessed inferior. There is an implicit acknowledgment that the goods are not first-rate, and the public accepts the acknowledgment. A consumer who sticks to gas lighting merely because it is cheaper is soon lost if his circumstances improve, or if the price of current falls, or if his wife falls to the incantations of the electrical canvasser.

Yet it would be wrong to imagine that the manager who thus attempts to preserve his lighting load on the score of cheapness alone is not himself a sincere enthusiast for gas lighting. The trouble is that many managers overestimate the strength of the appeal to the consumer's pocket. Yet there are few places where the difference in cost between gas and electricity is so great as to prevent the play of other motives, such as pride of possession, snobbery, perverted house-pride, and so on. Many working-class householders to-day have electric lighting which they cannot really afford when their whole budget is considered. By the same token they cannot really afford to go to the pictures as often as they do. Yet it would be useless to tell them that they would be better off in every way if they studied philosophy or did strenuous physical exercises instead of spending money on the cinema. And it is equally futile to tell them that they would be better off if they had gas light instead of electric light, when they know that most people in better circumstances than themselves use electric light.

The fact is that we are trying to resell gas lighting from the bottom upwards, instead of from the top downwards. The electricians secured their first market among the well-to-do classes; and now that the time has come to approach the poorer classes, the snob-appeal is brought into play with devastating effect. A working woman may agree if you tell her that gas lighting is cheaper; but if you tell her also that it is better for the eyes and the health, she will naturally ask why richer people, who need not consider the question of expense, have adopted electricity with seeming unanimity. The damaging answer is, of course, that electrical salesmanship has been better than ours, and that though electrical fittings can now be matched by gas fittings of equal convenience and cleanliness, the superior quality of gas lighting has never been brought home with sufficient force to the public.

The worst feature of the whole business is that the organization of the electrical industry on a national scale has coincided with the biggest housing drive in our history. Among those responsible for housing schemes, ignorance and prejudice have sometimes combined to oust gas lighting. Yet where a forward policy has been followed and gas undertakings have kept authorities well informed, there have been encouraging successes for gas. Two of the largest and most modern blocks of workers' flats recently completed in London—one north and one south of the river—have been completely equipped with up-to-date gas lighting, to the entire satisfaction of the authorities, the architects, and the tenants. Similar successes have been recorded in other districts; and in the North-East and in South Wales there have been many instances of gas lighting replacing electricity.

The Better-Class Market.

Yet this is not enough. If we wish to preserve the lighting load entire, we must make a frontal attack to capture public opinion. We must state forcibly the positive qualities of gas lighting. Judging from my own experience, there is a wide, better-class market for table-lamps and standards among those who work at home at night. A commercial artist of my acquaintance found the solution to eye-strain by having gas lamps installed in place of electricity. Eye-strain due to working by artificial light is a common complaint, yet few people even know of the existence of a gas table-lamp; several to whom I have mentioned it have thanked me for the tip. The gas consumption is not great, yet here is a wedge for re-entering the better-class market.

I was talking to a gas manager who is fighting savage competition, and winning: "I have scrapped all the lighting fittings in stock," he said, "since I saw the new range. In every possible case I am fitting washable plates to prevent ceiling-discoloration. The homes of my staff have been made into show-houses for gas lighting." I believe this is the best way to keep the lighting load. If

every gas manager could rid himself of existing ideas about gas lighting, and try to imagine that this was a heaven-sent load to be got by new methods of selling, I think there would be less cant and more success. And I look forward to the day when readers of national newspapers will rub their eyes as they see a full-page advertisement for gas lighting as the fashionable thing. But it is no use advertising until we make up our minds that we really want the lighting load, and are prepared to fight for it with every modern weapon at our command.

The Judges concentrate on the short list.

NATIONAL KITCHEN PLANNING COMPETITION

The B.C.G.A. Competition, which has occasioned such widespread interest to the advantage of our Industry, was brought to a triumphant conclusion on Monday at the Carlton Hotel, London, at a luncheon presided over by Sir Francis Goodenough, C.B.E., supported by Officers of the Association and members of the Executive Committee, and attended by principal prizewinners and a large gathering of the national Press. Perhaps "triumphant conclusion" is scarcely an accurate description, because very unfortunately Mr. Anthony Trew, of Poole, who, at the age of 75, triumphed to the tune of £500 first prize, was unable to be present, and also, as Sir Francis Goodenough humorously explained in an informal speech, the Association were still saving up for the prize money, which is to be handed to the winners by Lady Londonderry at the Ideal Home Exhibition. However, charming little speeches were made by the joint winners of the second prize (£100 each)—Mrs. N. Collins from Stoke-on-Trent, and Miss Elliot Douglas from Kelso. And as the three principal winners were from South, Midlands, and North respectively, so the other prizes—one of £100, ten of £10 each, and one hundred of £1 each—have been won by all parts of the British Isles.

The Competition.

Over 23,000 competitors entered. Appropriately enough 1st and 2nd (halved) prizes go to age and youth—the first to a retired business man of 75, and the second to the young wife of a Methodist minister who finds that gas to-day answers every need of the modern housewife. From practically every town and village in the British Isles, from New Zealand and from South Africa as well, entries poured in.

Competitors were given a plain rectangular plan of a kitchen and a number of appliances—door, kitchen cabinet, gas refrigerator, gas cooker, and so on—drawn to scale. These had to be cut out and pasted on the plan to give the best working arrangement of a well-equipped kitchen. A space was left on the form for suggested colour schemes, wall and floor coverings, and any other apposite remarks. The provision of alternative appliances for cooking, water heating, and heating added interest to the planning.

Judges.

The judges in the competition were Mrs. Darcy Braddell, Mrs. Eileen Murphy, and Sir Francis Goodenough, C.B.E.

Mrs. Darcy Braddell is a Gold Medallist for Decorative Design, and is well-known as an expert on interior decoration and kitchen planning. She has been associated with all kinds of exhibition work, and has for some years designed special kitchens and other rooms in connection with the Ideal Home Exhibition at Olympia. She was also responsible for the planning of the labour-saving kitchen at the Royal Academy Exhibition of British Industrial Art.

Mrs. Eileen Murphy and Sir Francis Goodenough are well enough known to our readers to require no further description.

Judges' Report.

"Judges were most impressed by the high standard of a very large proportion of the entries. When all those entries had been discarded which allowed no space for the doors of the room or of appliances to open, which squeezed appliances up together so that the occupant of the kitchen would have no access to them, or—as in a few cases—which proved that the senders had entirely misunderstood the conditions, there were left many thousands of entries, most of which showed that considerable thought and attention to detail had gone to their planning.

"Next to be discarded were the efforts of those competitors who added to the necessary plumbing and gas fitting by grouping their water heaters and other gas consuming appliances badly, and those who did not pay due attention to the importance of daylight for working operations.

"When the entries had been narrowed down in this way there still remained a formidable batch, and to find the ultimate prize winners it was necessary, firstly, to consider the proper arrangement of appliances in the correct sequence of their working order, and, secondly, to take into consideration such questions as the elimination of draughts, the relative space round working areas, and even the scope and completeness of the competitor's remarks.

"The primary merit of the winning entry is that the grouping of equipment is planned to simplify the routine work-circuit which must necessarily take place in every kitchen, whether it is in the preparation or clearance of meals. All fixtures are placed in logical working sequence, which is the first principle of labour-saving. In addition, the room is well balanced in the disposal of its equipment from the æsthetic point of view."

The Model of the 1st prize winning kitchen.

Scottish Junior Gas Association

Joint Meeting in Edinburgh

The Second Joint Meeting of the Eastern and Western Scottish Junior Gas Association was held on March 9 at the Mining Department of Heriot-Watt College, Edinburgh, when about 60 members assembled to hear Prof. Henry Briggs, D.Sc., Ph.D., A.R.S.M., give a Paper on "Some Recent Results of Coal Research."

In opening the meeting, Mr. A. J. Doran, Vice-President of Eastern District, welcomed the Western members. He said they were indebted to Principal Smail, of Heriot-Watt College, and Prof. Briggs for the arrangements and permission to see the Mining Laboratories and Rescue Station.

Prof. Briggs then delivered his Address, which was a summary of the work that had been done by his Department into the researches of coal. He said that there was never a time when more research work was being done on coal than at present and it was all very necessary in order that the best coals for particular purposes might be used and so ensure efficient and economical working and results. He instanced the requirements of high and low temperature carbonization, coke ovens, and production of tar and oils for hydrogenation, as all requiring particular qualities of coal. The constitution of coal was being studied by some, hydrogenation by others, and the microscopists were examining it for spores and geological significance in endeavours to trace the origin and formation. Then wet and dry cleaning methods formed another practical branch of research and valuable work on weathering of coals in relation to their storage properties was being carried out in Edinburgh. He did not think this work had ever been carried out before, and should be of great use in deciding which coal was most suitable for storage.

He was in favour of research work which had a practical and commercial outlook, and he did not favour subdividing coals into many parts, and giving many and various names, thus complicating the subject. As a guide to his remarks, he gave three headings under which he would trace the evolution of coals, viz.: (1) Classification. (2) Anthracitation. (3) Oil from coal. With the aid of lantern slides and diagrams, depicting many analyses of coal from all over the world, he showed the relation between peats, lignites, bituminous coals, and anthracites, and how they were all of one family at different stages of evolution. For this evolution, three powers were at work—warmth, pressure, and water—and with these influences and time the change from peats to anthracites was effected. The diagrams clearly showed how, with the loss of oxygen and hydrogen and the resultant gain in carbon, a relationship between all classes of coal existed. These elements were liberated from the coal by chemical changes, the principal gases given off being carbon dioxide, methane, water vapour, and nitrogen, all of which were found in varying degrees in underground workings depending on the class of coal being worked.

Prof. Briggs then showed the relation between the common coals, semi-cannel, cannels, shales, torbanites, heavy and light oils, and how from many analyses it would appear that they were all derived from a similar source at the peat stage, but had lost varying degrees of oxygen and hydrogen in their formation, thus giving the varieties of fuel that we know as oil and coal. Samples of these varieties were on view.

Mr. Doran, in thanking Prof. Briggs for his lecture, said they were much indebted to him for having given them such an interesting and instructive Paper on a subject in which they were all so interested.

Mr. Melvin (Assistant Engineer and Manager, Edinburgh) mentioned the work they were carrying out with weathering of coals. He said it would be some considerable time before anything could be said regarding the losses which took place during storage, but the results should be most useful when published.

Mr. J. Greig (Glasgow), President of the Western District, returned thanks to the Eastern District for their invitation to Edinburgh. He believed that it was departments such as those under Prof. Briggs which were most suited to carry out coal researches, as they could collect data from many sources and so were in a position to give authoritative advice on coals and their uses. It was believed that coal would outlast oil and that we should conserve the use of coal on which we were all dependent. He asked if it would be possible to separate the durain, vitrain, and clarain constituent to get varying degrees of quality and coking properties?

Prof. Briggs, in reply, said that constituents could be separated either by the friability of coal or froth flotation, and if ever it was a commercial proposition he had no doubt that that aspect could be tackled through research.

The members were subsequently shown over the Mine Rescue Station where the local Mining Rescue Parties receive their training. Many types of respiratory apparatus were on view, and their applications was demonstrated.

The party were then shown over the underground mine workings which have been constructed similar to actual pit conditions and in which various types of training for mining students are given.

London and Southern District Junior Gas Association

Visit to the Gothic Works

By kind invitation of the management, a visit was paid by the London and Southern District Junior Gas Association to the Gothic Works of Thomas Glover & Co., Ltd., and R. & A. Main, Ltd., on Wednesday, March 13. Well over 100 members availed themselves of the opportunity of inspecting the Works. Coaches conveyed the party from 48, Grosvenor Gardens to Edmonton where the Works are situated.

The two firms amalgamated in the year 1897 and the business grew so greatly that the old Clerkenwell Works was no longer large enough to cope with the output, and so it was decided to build a factory at Edmonton on up-to-date lines. Ever since the original buildings were completed in 1899, the Gothic Works have been extended, bay by bay, until at the present time the two factories cover over 13 acres.

The meter assembly shop of Messrs. Thomas Glover & Co. is a perfect example of a mass-production building. The excellent lighting, spaciousness, and purity of atmosphere are typical of present-day factory planning. Used air from the benches is exhausted by a suction plant and replaced by purified air supplied by a special filtering plant. Certain benches in the tin shop are set aside for repairs to every type of meter. One bay, the full length of a shop, has been set apart for proving meters. The importance of temperature is appreciated here and members noticed the judicious placing of the holders and the perfect ventilation.

All meter parts awaiting issue to the shops are stored in steel bins of modern design, and everything is arranged to ensure speed of handling in the distribution of components. The air-conditioning and exhausting plant is worked primarily from two Spencer-Bonecourt gas-fired boilers which are thermostatically controlled, and the heat is distributed into the various departments by means of "Unit" heaters. These units are designed to maintain a temperature of 60° F. throughout the buildings when the outside temperature is 32° F. The units are capable of introducing 20,000 c.ft. of fresh filtered air per minute.

The cupolas in the foundry are each capable of turning out 9 tons of molten metal per hour. All plant and blowers in connection with them are in duplicate in case of breakdowns. The core shop turns out 20,000 cores per week. Each man in the moulding shops, which accommodate 3,000 boxes, handles about one-quarter of a ton of molten metal per day.

In the enamelling shop the members witnessed the charging and discharging of the battery of gas-fired muffles for stoving. The consumption of each muffle is about 500 c.ft. per hour and the working temperature is graded from 750° to 900°, according to the type of work to be done. Before being placed in the muffles the articles are sprayed in the booths which are situated down one side of the building. The gas used in the various processes is supplied by the Tottenham and District Gas Company and amounts to almost 100 million c.ft. per annum.

After the inspection of the Works, high tea was provided by the Directors of Messrs. R. & A. Main in the canteen. Mr. F. C. Smith, President of the Association, ably accorded the thanks of all present to the Directors of the Company and referred to the excellent methods employed at the Gothic Works. He was glad to welcome Mr. Walter Grafton, the founder and first President of the Association. Mr. Smith made mention in felicitous terms to his early technical training under Mr. Grafton. The vote of thanks was carried amid acclamation. Mr. C. Marley, General Manager of Messrs. R. & A. Main, briefly replied on behalf of the Directors and added that it was a real pleasure for them to receive parties such as the London and Southern District Junior Gas Association.

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Easy Coal Travel — resulting from the Upward Heating System which permits a correct zoning of heats.

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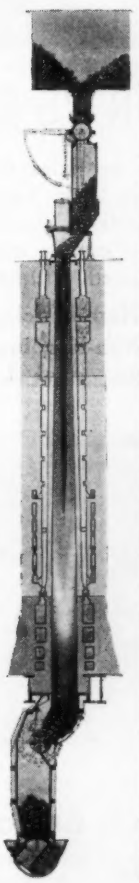

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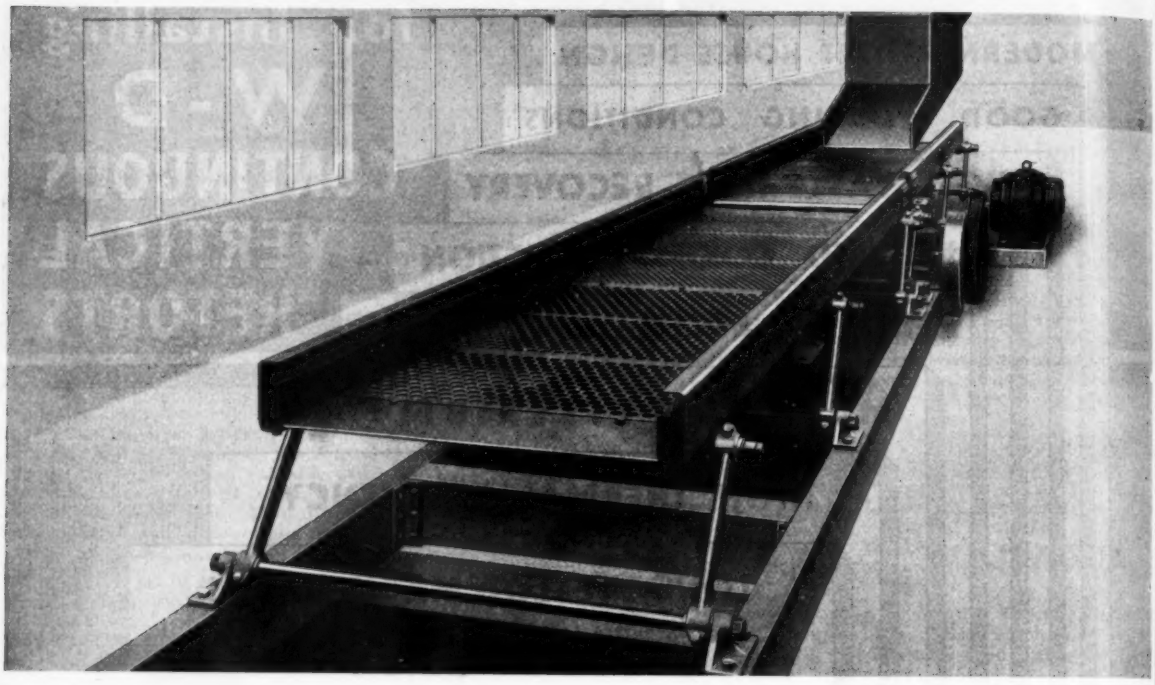

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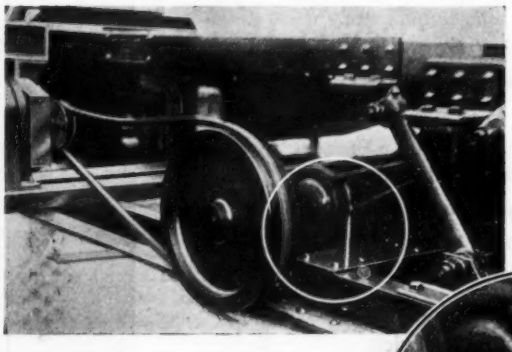

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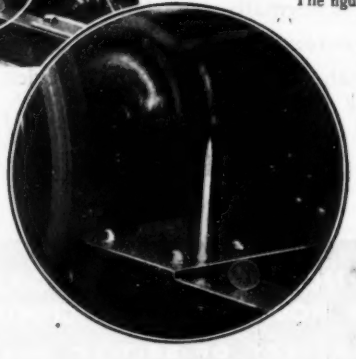

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The illustrations are from a snapshot taken of our Screening Conveyor during test for vibration transmitted.

The condition of test:

Underframe not bolted down, pencil and coin placed as shown, the Screening Conveyor started up, run at 325 r.p.m. and stopped.

Result: pencil and coin remained as originally placed.

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Messrs. The Coppee Co.
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A Textbook of American Gas Practice*

Reviewed by C. A. Masterman, M.A., F.I.C.

Professor Morgan's book represents a useful survey of American gas practice. Its chief weakness lies in the reader's uncertainty as to whether it is intended to be technical or commercial. As a book of nearly 1,000 pages it is too discursive and the various sections are not well balanced. In its original publication in the form of a number of pamphlets for the training of students these weaknesses would be less noticeable.

The earlier portions of the book deal with gas distribution followed by the house installation and gas sales from the technical and commercial points of view, concluding with accounting, rate structure, and public relations. The author refers to the co-operation he has received from the American Gas Association, and at the end of each section includes a useful bibliography, unfortunately limited to American and a few British sources of information.

As a technical work the volume is inadequate, and the references are not always sufficiently critically chosen. In the space devoted to governors and governing more practical assistance might well have been given to the technical requirements of design and installation. Characteristic curves of registration and pressure loss would have added value to the section on meters, especially in view of the later section on "Unaccounted-for Gas," which does not appear sufficiently to appreciate the potential revenue loss associated with indifferent meter performance. Both the hygienic and gas appliance aspects of ventilation are of vital importance to the gas utilization engineer, but scarcely receive mention. Considerable attention is given to burner design and to the effect on combustion of changes in gas composition due to the introduction of natural gas, but little practical guidance is given as to the effect on combustion of the various factors in appliance design.

The treatment of heat transfer insufficiently stresses the importance of recent work on high-temperature radiation from gases and appears to confuse this phenomenon with the incidental radiation from incandescent carbon particles present in luminous flames.

The incidence of condensation is not due, as the author suggests, to the average flue gas temperature falling below the dew-point, but, a much more troublesome matter, to the temperature of *any* part of the flue gases at *any* point falling below that critical limit.

The most important load to the Gas Industry in U.S.A. as in Great Britain is the cooking load. In this connection the author appreciates the importance of rapid operation on the hotplate, yet is content to accept about 18 c.ft. (9,000 B.Th.U.) per hour as a normal boiling burner consumption and refers to 24 c.ft. (12,000 B.Th.U.) per hour as "Giant." Electric and gas cost comparisons for cooking are given as 2·2 to 1 on a fuel cost basis which on cookers in Great Britain would lead to the expectation of at least 3 to 1.

There is a satisfactory degree of economic reality and considered planning throughout the volume which many British readers will envy. The appropriate policies to govern such various problems as pipe protection, new business, tariffs, or industrial heating are analyzed and discussed with the confident assumption that there exist ample reserves of trained personnel for the carrying out of the statistical and technical surveys involved. Many such surveys have been carried out to the enrichment of the reports of the A.G.A., of which the fullest use is made in this book. Perhaps of especial interest at the moment are the cost analyses reproduced in the chapter, "Selection of an Industrial Fuel," for different industrial purposes with different fuels.

In a volume of this kind it is unusual to find throughout so lively a consciousness of the consumer's point of view. Professor Morgan stresses that "the sale of the appliance is only a means to an end and that the principal function is not the sale of appliances, nor even the sale of the gas, but the sale of gas service."

The Gas Industry in Great Britain has been less successful than that in America in combining the technical and commercial aspects into one. Perhaps the process involves a sacrifice we hesitate to make. The commercially minded reader of Professor Morgan's book may become bewildered, the technically minded will perhaps be infuriated. There can be few who will not find something of interest, be it only the æsthetics of colourings on gasholders or the appropriateness of laboratory personnel for administrative duties on plant or district. For the persevering reader the book holds many stimulating rewards, especially if he is unfamiliar with the enterprise of the Gas Industry in that unprecedented country, the United States of America.

*"A Textbook of American Gas Practice," Volume 2, Distribution and Utilization of City Gas. By Jerome J. Morgan, M.S., Ph.D., Associate Professor of Chemical Engineering Columbia University. Price $8.00.

Sedgley's New Plant

A large number of local councillors, representatives of neighbouring gas undertakings, and officials attended the opening of the new extensions to Sedgley Urban District Council's Gas-Works at Lower Gornal on Saturday last.

Mr. J. Brettle, Engineer and Manager, conducted a tour of the extensions. After the tour Councillor N. G. Cook declared the extensions open, and the party went to the Council House, where refreshments were served.

The Extensions Described.

In 1931 the Sedgley Urban District Council promoted the Sedgley Gas Special Order, under which was scheduled additional land for manufacture and storage of gas. Following this the Council instructed their Engineer to prepare a comprehensive scheme for modernizing the plant. This was submitted to the Ministry of Health and Board of Trade, and having received the necessary consents, the work was put in hand at a cost of £16,200.

The exhausters, Livesey washer, rotary washer-scrubber, and gas heater have all been properly housed and are prepared for future extensions. All the gas connections are above ground and are readily accessible for examination and painting. The old meter house is now converted into a mess room and it is proposed to make a repair shop and stores of the old purifier house.

The suction tar extractor has a capacity of 500,000 c.ft. per 24 hours. The air-condenser was removed from its existing position and erected and connected up to work in conjunction with a new water tube condenser, a new by-pass being added. The water tube condenser also has a capacity of 500,000 c.ft. per 24 hours. The connections are 15 in. diameter, and the gas is controlled by a specially constructed four-way valve, with a central passage which allows of the flow being either forward or backward, and also enables the condenser to be by-passed.

The exhausters, which are in duplicate, have been re-erected on the new site. They were thoroughly overhauled and re-conditioned prior to re-fixing. The foundations have been made large enough to take a larger exhausting plant at some future date.

The Livesey washer has a capacity of 750,000 c.ft. per 24 hours, and consists of a cast-iron vessel fitted with standard bubbling troughs.

The washer-scrubber is built in one unit with four chambers, and is driven by a self-contained vertical steam engine and worm reduction gearing, and is arranged so that a future unit can be added.

The gas heater has a capacity of 750,000 c.ft. per 24 hours. There is no difficulty in heating up the gas to 100° F. using only exhaust steam.

There are four purifiers arranged in line, each 20 ft. long by 20 ft. wide by 5 ft. 6 in. deep, in one box, with three division plates. They rest on a concrete foundation at the ground level, with a roof covering of slates carried upon steel roof principals. The connections are arranged alongside the boxes in a trench and are 15 in. in diameter. The purifiers are provided with Milbourne valves of the vertical disc type, and have internal reverse flow valves which permit the gas to have upward or downward flow in any box, at will. There is one steel cover to each purifier, electrically welded throughout and held down by screwed ring swing bolts and fitted with Milbourne-Beard patent rubber pads. There is a specially constructed revivifying floor of concrete built up to within 2 ft. of the level of the top of the boxes.

The existing rotary meter was re-erected on new foundations in a new house, and was fitted with a new by-pass connection and Audco patent lubricated disc valve.

The gasholder is constructed on the spirally-guided

principle, and has a storage capacity when fully inflated of 500,000 c.ft. of gas. It is constructed with three lifts working in a steel tank.

The whole of the valves throughout the new plant are of the Audco lubricated disc type having all seating surfaces sealed and protected with lubricant so as not to expose any faces to the gas when the valves are opened or closed. This is the first gas-works where this valve has been used exclusively.

Contractors.

The following is a list of the Contractors for the various sections:

The suction tar extractor, removal and re-erection of air condensers, water-tube condenser, re-erection of exhausters, Livesey washer, rotary washer-scrubber, gas heater, purifiers, re-erection of rotary meter, gasholder, and Audco patent lubricated disc valves and gas mains: Messrs. C. & W. Walker, Ltd., Donnington, near Wellington, Shropshire.

The foundations for gasholder and purifiers, together with retaining wall, and works mains and connections: Messrs. Thomas Vale & Sons, Ltd., Stourport.

Builders of exhauster house, washer house, meter house, boundary walls, and foundations for plant: Messrs. J. Hickman & Sons, Brierley Hill.

Foul main and roof over purifiers: Messrs. Gibbons Bros., Ltd., Sedgley.

Construction of revivifying floor: Messrs. Worton & Blackham, Builders and Contractors, Sedgley.

THE USE OF Oils in Gas-Works Practice

by L. W. HATHAWAY

In a Paper read before the Midland Junior Gas Association at Birmingham on March 7, from which we give an extract below, Mr. L. W. Hathaway, of Wolverhampton, discussed the various types of oils in general use in the Gas Industry.

According to Griffith,[1] it is possible to determine the suitability or otherwise of an oil for carburetting purposes by means of a simple chemical analysis, by which the paraffin, olefines, naphthene, and aromatic content is rapidly determined. Hollings[2] says that the thermal yield of an oil is dependent upon the content of paraffinic and unsaturated bodies, and he shows with a series of figures that most therms are produced from an oil in which the sum of these two bodies is the highest. The following are a few of his figures:

Paraffinics and Unsaturateds. %	Therms.
81·7	1·45
60·1	1·20
45·6	1·16
18·5	0·72

In a recent contribution[3] to the "GAS JOURNAL" it was shown by figures which proved fairly conclusively that the available hydrogen content of an oil gives some indication of its carburetting value, which, it was explained, is the reason why tars have such a small value as carburetting agents since they possess such a low available hydrogen content—namely, about 5%. The available hydrogen content may be defined as the hydrogen remaining after all the oxygen in a compound has been calculated to water. It is claimed that an analysis for carbon, hydrogen, oxygen, nitrogen, and sulphur, together with the calorific value determination can, in a bomb calorimeter be completed in four hours. The following figures were appended to the articles:

Available Hydrogen. %	Lbs. of Oil Required for 1,000 C.Ft. of 530 B.Th.U. Gas.
14	14·0
12	19·6
10	28·0
9	37·0
8	51·0

It was pointed out that an oil with 14% hydrogen is worth twice as much as one containing 10%, and it will be observed that the carburetting value falls off very rapidly when the hydrogen is below 9%.

It is maintained that the correlation of hydrogen content with the carburetting value of gas oil holds good with oils varying in specific gravity from 0·8163 to 1·0377 and is deserving of more careful study.

Lubricating Oils.

Lubricating oils form an integral part of all modern machinery, but it is more easily renewed than most other parts. The need for frequent renewal is not due to the oil being consumed, but merely because it becomes contaminated with impurities, which include products of oxidation, since exposure to air is as detrimental to oil as it is to iron and steel.

The main object of lubricating oil is to prevent the destructive action of the friction caused by moving solids, a duty it fulfils by separating the two surfaces. Providing the supply of lubricant can be maintained between the moving parts, the nature of the liquid matters little, the thinner the better, since it offers less resistance, water having in some instances been used. An oil no heavier than that used for bicycles will, with the aid of a forced feed, lubricate some of the heaviest machinery, such as a large steam turbine. Forced feed is not possible on all types of power units, as they are too complicated, while the reversal of movement in a reciprocating motion would tend to break up the thin oil film. We have, therefore, to depend upon a special property in the lubricant which enables it to resist being squeezed out from between the surfaces which it is desired to lubricate. A liquid which possesses this property is stated to be oily and the lubricating powers of a liquid are in proportion to its "oiliness." It is believed by oil technologists that fluids which possess the property of oiliness are capable of forming a loose combination with the metals they are to lubricate. It is not suggested that any violent chemical reaction occurs, which would be fatal, but that a surface attachment results comparable to the rooting of blades of grass in a lawn. This surface attachment is such that should an extreme pressure tend to squeeze out the unattached lubricant a minute quantity will always remain adsorbed by the metal and thus, within limits, prevent "seizing."

In addition to causing a cushioning effect and thus theoretically preventing wear a lubricant acts in two other very necessary capacities—namely, as a disperser of heat and as a preventive of corrosion.

To fulfil the above requirements it is necessary for an oil to possess the following qualities:

(1) It must possess "oiliness."
(2) Its body or viscosity at the prevailing temperature of the machine must be such to maintain a reasonably thick film under fluctuating pressure. But it must not be so viscous as to cause friction or drag when the machine is cold.
(3) It must possess good capacity for heat transmission.
(4) Its corrosive action must be negligible.
(5) It must be able to withstand the harmful effects of both high temperatures and oxygen.

Application to Machinery.

Oils generally are graded to answer the specifications of the British Standards Institution, and the makers of machinery usually state the grade of oil which is to be used. The following is a description of the oils used in some of the machinery on a modern gas-works.

Stationary steam engines of the open type need a bearing oil for external lubrication, a straight run red oil being usually used. With worn bearings or a heavy load a proportion of fatty oil is often added. For the internal lubricant a dark cylinder oil is used, which with saturated

[1] Griffith. *J. Soc. Chem. Ind.*, 1928, **47**, 21T.
[2] Hollings. The Manufacture of Gas (Water Gas), p. 91.
[3] Herkus and White. "GAS JOURNAL," Jan. 23, 1935.

steam should give a fire test of about 600° F. For superheated steam a fire test of 650° F. is necessary and the viscosity figure proportionately higher. A cylinder oil for the latter purpose often has a small proportion of non-drying animal oil mixed with it which tends to soften the carbon deposit and also to emulsify when wet steam is present and thus form a protective covering on the cylinder walls.

Turbine oils should be capable of withstanding oxidation on account of the violent churning to which they are subjected in circulation. Oils of Pennsylvanian origin are usually used since they are high in saturated bodies. To secure satisfactory running, an oil of suitable viscosity at the operating temperature must be chosen, thin enough to circulate freely yet of sufficient body to float the shaft. If too heavy a grade be employed a large amount of power will be used up in overcoming the internal friction of the oil film and thus raise the bearing temperature, while the circulatory system will be sluggish in its action, which again will tend to promote hot bearings. We are told by authorities that the amount of power converted into heat in the bearings of a turbine is seldom less than 0·2% of the rated horse-power and may, with an unsuitable oil, be even more. This is an appreciable amount of heat and shows the need for an adequate supply of clean, fluid, well-cooled oil. The demulsibility of a turbine oil is of immense importance, since a considerable loss of oil is often attributable to the fact that it is withdrawn as an emulsion.

One oil is usually required for both cylinder and bearings of a gas engine, but two are sometimes used, and in this case that for cylinder lubrication should be free from carbon deposits. A straight run pale or red oil of medium viscosity will suffice for both purposes, though the type of oil is governed entirely by the design and condition of the engine. A medium gas engine oil according to the specification of the B.S.I. should have a nominal Redwood viscosity of 165 seconds at 140° F. In order to reduce carbon deposits fatty oils are often mixed with mineral oils in proportions varying from 2-10%.

The automobile now plays an important part in all industries and its lubrication is a problem upon which much research has been carried out. The three main features of a suitable lubricant are: (1) Correct viscosity, (2) low cold test, (3) low carbon deposit. The first feature depends upon the make of engine and climatic conditions, heavy motor lorries generally requiring an oil of high viscosity. A medium oil with a viscosity of 165 at 140° F. is suitable for most British cars, though a less viscous oil is usually used in winter than in summer. A low cold test, not exceeding 25° F., is essential for all internal combustion engines, since it ensures easy starting and an ample supply of lubricant to all parts of the engine.

The oil is usually blamed for carbon deposit, though other causes are more likely, the chief being (1) incomplete combustion, through badly adjusted carburetters, (2) over-lubrication, the excess oil being burnt and forming carbon, (3) loose piston rings and worn cylinders. The carbon deposit of a good motor oil should not exceed 1% and should be much lower.

Care, Handling, and Storage of Lubricants.

The object of correct lubrication is to ensure maximum production by machinery with the lowest operation and maintenance costs. The manufacturers of oils and greases naturally strive to produce lubricants that will attain to that end, and they take every precaution to prevent the ingress of foreign matter to their products. It is of equal importance that the consumer ensures absolute cleanliness up to the time the lubricants are put into service. Considerable harm can be caused to oils by allowing dust, dirt, moisture, and other impurities to become mixed with them before use. The care of wood barrels is a very important consideration, and wherever possible their storage in the open should be avoided. Where this is unavoidable they should be protected from the sun and rain. Barrels should never be stood on end, as moisture collecting on the head may penetrate to the interior, they should be laid on their bilges, bungs upwards and elevated to allow a current of air to pass underneath. If it is suspected that water has gained access to the contents of a barrel the weighing of same and the comparison of that weight with the one shown on the end of the barrel forms a ready check. An increase in weight will show that the contents are contaminated with water or that it has soaked into the wood. The exterior of a barrel should be cleaned thoroughly before opening, to remove any dirt which may have become attached. Such impurities are likely to be abrasive in character, and if they are mixed with the oil may jeopardize the life of a machine. Foreign matter is also likely to clog the finely adjusted needle valves of bottle oilers or the wicks of syphon oilers or retard the rate of flow in drop feed oilers. The same care should be exercised to prevent contamination of grease.

A bung should never be driven into a barrel, pounding on adjacent staves will loosen it sufficiently to withdraw it. When replacing a bung in its barrel the grain of the bung should run in the same direction as the staves, otherwise it may distort and split. When a tap is fitted into a wood barrel the bung should not be removed and the tap hole should be drilled at the lower side of the end of the barrel bearing the full brand name. The oil store should be kept at an even temperature. If too high the body of greases might be affected, even separation may occur, while if the temperature be too low the viscosity of the oil will increase, causing difficulty in handling. Steel barrels are rapidly coming into favour. They have the decided advantage of internal cleanliness.

Paint Oils.

The oils generally used as paint vehicles are linseed and tung, the latter having come into use during the past twenty years or so. They are used for painting since they possess the essential property of becoming hard on drying when exposed to air.

Linseed oil is judged according to the result of examination for colour, odour, and specific gravity, the latter being between 0·931 and 0·935. In addition the following chemical tests are carried out: Acid value, saponification value, unsaponifiable matter, iodine value, and drying time.

The tests for tung oil are similar to those for linseed. The specific gravity is 0·939-0·943, with an additional test, the heat test. Pure tung oil sets to a solid gel when heated at high temperatures, and impurities retard this change. The gel obtained should be firm and non-sticky and crumble or cut easily and cleanly.

Turpentine is an essential oil and is used principally as a "thinner." Genuine refined turpentine should be colourless and free from water and visible impurities. Its specific gravity should be between 0·862 and 0·872. A distillation test should give less than 1% below 150° C. and more than 95% below 170° C. The residue on evaporation on water bath and heating at 100° C. for two hours must not exceed 2% by weight. The flash point (Abel's close test) should be above 90° F. Other tests are, estimation of petroleum and aromatic hydrocarbons, and polymerization.

Discussion.

The CHAIRMAN (Mr. J. H. Wainwright) congratulated the author upon his presentation of the subject.

Mr. F. A. JENKINS (Leamington), in proposing a vote of thanks to Mr. Hathaway, said that at Leamington, apart from gas oil, they used about fifteen oils, and, in addition, had small quantities of at least an equal number for special applications. He presumed that at the present time most of the lubricating oils were obtained from crude petroleum, but there seemed a certain amount of optimism that they would be able to be obtained from coal. Their lubrication oil was contracted for on an "output of gas" basis, which he thought was a fairly common practice in the Industry and was a method which had worked very well. In most instances, a rebate was obtained if the consumption of oil were less than the estimated quantity. He pointed out that lubricating oil was unsuitable for use for screwing wrought-iron and steel pipes, it being necessary to use a "cutting" oil or similar compound. The large oil companies had effected many improvements in lubricating oils during recent years. Among other things, they had reduced the amount of colouring matter, and heavy oils were no longer dark in colour, although some people still expected them to be.

Mr. A. R. MYHILL (Birmingham), who seconded the vote, said industry would collapse if it were not for the availability of oil. The author had not mentioned small-scale cracking tests. In his opinion, it was almost impossible in a laboratory to reproduce conditions not only which were comparable with works practice but which were comparable one with the other. The only thing they could do was to say that an oil was good or bad. He thought that laboratory tests were practically useless, in spite of all that had been said to the contrary.

Mr. C. B. BALL (Wolverhampton) asked if any efforts had been made either by filtration or settlement to recover lubricating oils for use in rougher types of machinery.

Mr. W. MCNAUGHTON (Wolverhampton) said that the profits on oil, like those on fire cements, were made upon the amount of waste.

Mr. HATHAWAY, in reply, thanked the members for the kindly way in which they had received his Paper, and referring to the colour of oils said that the paleness of the heavy oils was probably due to the use of vacuum stills instead of the old process of bulk distillation. With regard to the temperature at which oil should be stored, he was of opinion that if conditions were too hot it might cause the adulterations in the oil to separate out. At Wolverhampton they recovered turbine oils by a process of filtration.

MIDLAND ASSOCIATION OF GAS ENGINEERS AND MANAGERS

Annual General Meeting at Birmingham

An excellent attendance of members and a number of distinguished visitors marked the Annual General Meeting of this Association, held last Thursday at the Grand Hotel, Birmingham, in the course of which Mr. Arthur Roberts was inducted as President, and delivered an interesting and instructive Address.

THE NEW PRESIDENT.

Mr. ARTHUR ROBERTS, of Hereford.

Mr. Arthur Roberts is a native of Hereford, and was an articled pupil in Gas Engineering under Mr. W. W. Townsend—a former Engineer and Manager at Hereford, and now of Colchester. For 25 years Mr. Roberts has been connected with the City of Hereford Gas Department. In 1913 he was appointed Assistant Engineer and Manager, and from September, 1914 (at which time the late Lieut. C. V. Townsend joined the Army), he was engaged as Acting Engineer and Manager. In 1918 he was appointed Engineer and Manager. In 1928 Mr. Roberts completely re-organized the administration of the Department and was then appointed to his present position, that of Engineer and General Manager. During Mr. Roberts' managership the Works has been practically rebuilt; vertical retorts have replaced the horizontals, and, in addition, high-pressure gas plant, water gas plant, wet purification plant, new stores, and showrooms have been erected. Mr. Roberts acted for three years (1929-1932) as Hon. Secretary and Treasurer of the Midland Association of Gas Engineers and Managers, and he is the first Engineer from Hereford to be elected President. Mr. Roberts holds the City and Guilds of London Certificates in Gas Manufacture and Gas Supply. During his control of the Hereford Undertaking the gas make has increased by 66%.

There was an excellent attendance of members at the Annual General Meeting of the Midland Association of Gas Engineers and Managers, held on Thursday, March 14, at the Grand Hotel, Birmingham. In addition, the Association were honoured by the presence of Mr. C. Valon Bennett, President of the Institution of Gas Engineers, Mr. J. R. W. Alexander, Secretary of the Institution, Mr. W. J. Smith, Secretary of the National Gas Council, and other visitors.

Mr. R. S. RAMSDEN (General Manager and Engineer of the Leamington Priors Gas Company), the retiring President, occupied the chair at the outset of the meeting, and, the minutes of the Autumn General Meeting having been taken as read and signed, he spoke a few words of welcome to their distinguished visitors, mentioning also the presence of Dr. Harold Mason, Chairman of his own Undertaking.

Mr. C. VALON BENNETT thanked the Association for the welcome they had given to him and for the hospitality they had extended. He brought them a message of goodwill from the Institution of Gas Engineers, and he congratulated them upon their membership of 107. In view of the forthcoming Jubilee Celebrations of Their Majesties the King and Queen, he emphasized the necessity for making early arrangements for accommodation in London for those attending the June Meeting of the Institution.

Dr. HAROLD MASON also addressed a few words to the members, remarking that, personally, he was an optimist, and that electricity was not going to do the Gas Industry any harm. They could score in the future by means of chemistry, which could teach them how to use their residuals to better advantage, which, in turn, would assist in keeping down the price of gas. He also acknowledged, in conclusion, their kind hospitality to him that day.

The death was reported by Mr. Ramsden of Mr. H. G. Harrison, Engineer, Manager, and Secretary of the Ashbourne Urban District Council Gas Department, and the members stood for a moment in silence as a mark of respect to his memory.

Adoption of Report and Accounts.

Mr. RAMSDEN then formally moved the resolution for the adoption of the report and accounts for the year. He remarked that the report gave a full and lucid account of their activities during the past twelve months and did not call for any further comment. The accounts for the year ended Dec. 31, 1934, showing a balance of £77, he said, were satisfactory and had been duly audited.

Mr. A. H. CRANMER (Wolverhampton) seconded the resolution, which was unanimously adopted.

The following new members were then elected by ballot:

Mr. F. G. Mantle, Acting Secretary of the Lichfield Gas Company.

Mr. W. Williams, Engineer and Manager of the Tipton Urban District Council Gas Department.

The New President.

Mr. RAMSDEN said it was now his privilege to hand over the reins of Office to their new President, Mr. Arthur Roberts—and he did so with every confidence that, under his charge, their Association would continue to prosper. Mr. Roberts had already served them well. After having been a member of the Midland Junior Gas Association for some considerable time, he joined the Senior Association in 1919 and had given them Papers on two occasions—the first in 1923 dealing with his re-construction work at Hereford, and the second in 1932 dealing more particularly with vertical retort practice—while they would all remember how well Mr. Roberts served them as their Hon. Secretary from 1929 to 1932.

This twelve months, continued Mr. Ramsden, seemed especially connected with Jubilees so far as their Association was concerned. In addition to that of Their Most Gracious Majesties, to which they were all looking forward loyally, their Vice-President, Colonel Eunson's fifty years with the Northampton Gas Company and Mr. Roberts' twenty-five years with the Hereford Gas Department had both been celebrated within the last few months; and he was sure they would all wish him to offer their congratulations to these gentlemen and to express the hope that they might long continue to carry on and enjoy the work of their calling as Chartered Gas Engineers.

In handing over to Mr. Roberts the insignia of Office of President of the Midland Association, Mr. Ramsden said he could not wish him anything better than to hope that he would have as happy a year as President as he himself had done.

Mr. A. ROBERTS, on taking the Presidential Chair, said his first duty was to propose a vote of thanks to the retiring President. He thought they would all remember the very interesting Presidential Address Mr. Ramsden gave them twelve months ago, while they would remember even more vividly the day they spent at Leamington, which was marked by the presentation of a goblet to the Earl of Warwick for his son. Mr. Roberts said he did not know anyone who could have carried out that function better than Mr. Ramsden. In addition, they visited his works where they saw evidence of his foresight and ability.

Mr. C. M. D. BELTON (Shrewsbury) seconded the vote of thanks, remarking that they had all much appreciated the services Mr. Ramsden had given them during the year as President of the Association. They could always look to Mr. Ramsden for advance, and they were heartily thanked him for the yeoman service he had rendered to them.

Mr. ROBERTS then presented Mr. Ramsden with the Past-President's Medal.

Mr. RAMSDEN thanked them very much indeed for their kind words in regard to his Presidency and also for the Medal. It was, he said, he who should be expressing his thanks—and he did so very sincerely—to those who made possible whatever success there might have been in their Association's affairs during the last twelve months. He referred particularly to their Hon. Secretary, Mr. S. J. Sadler, who had been a tower of strength to him, and though he had leaned heavily upon him he had never grumbled. He also acknowledged the assistance of the Committee and members generally, who had supported him so well on every occasion; his Directors and fellow workers at Leamington, without whose help the visit would have been impossible; and, lastly, those friends of all of them—the Technical Press—who polished up and turned into readable English their—or he should say his—halting remarks.

Mr. ROBERTS, before reading his Presidential Address, referred with appreciation to the presence of the President and Secretary of the Institution of Gas Engineers and of the Secretary of the National Gas Council. They all knew what busy lives these gentlemen led, so that to find them there with the Association at Birmingham augured well for the Industry. He also referred with pleasure to the presence of Councillor Bernard Powell, of the Hereford Gas Committee, who was there in the absence of the Chairman, Alderman Witts.

Presidential Address of Arthur Roberts, M.Inst.Gas E.

In the first place I should like to express my deep sense of appreciation of the honour you have conferred upon me. I believe it is the first occasion on which a Hereford Engineer has occupied the Presidential Chair, and I regard this as a signal honour both to myself and the City I have the honour to serve. My predecessors have all been gentlemen who have added dignity and lustre to the Association and left behind a trail which is difficult to follow. I will however, do my utmost to uphold and maintain the high standard they have set.

Twenty-six years ago I entered the Gas Industry as a raw recruit, and during the period which has followed I have seen many changes in both personnel and system; but no change has struck me more forcibly than the advance in carbonization. My experience of the vertical retort has convinced me of its capacity, flexibility, and, given the correct fuel or fuels, its simplicity of control.

In the short space of five years I have tested 45 samples of coal under working conditions with varying throughputs, and, in some cases, slight alterations in temperature. The result of such tests has enabled me to discover what I consider to be the most suitable mixture of coals for a works geographically situated as Hereford is, with a downwardly-heated installation producing gas of a C.V. of 450 B.Th.U., and also having in mind the fact that a good market exists for an even quality coke—*i.e.*, graded, low moisture and ash contents. At the present time, using all washed double nuts, the following is the mixture:

Yorkshire	62%
Staffordshire	22 ,,
Derbyshire	16 ,,

During the twelve months ended Dec. 31 last the following results were obtained:

Total gas made	257,346,000 c.ft.
,, per ton	20,559 ,,
,, ,,	92·5 therms
Declared C.V.	450 B.Th.U.

Residuals.

I am a firm believer in the use of coke in the domestic grate; it is a strong contributor to the prevention of smoke pollution, is clean, cheap, and highly efficient, and with the recent design of coke fires can be burnt fully incandescent to the last. Some few years ago I introduced a system of selling coke in paper sacks containing approximately 30/35 lbs.; there are many consumers who have made use of this ready means of obtaining small quantities of coke, and it is especially suitable for the modern house with small fuel storage room. The careful grading of coke has been a step in the right direction, and together with a flat charge for delivery, regardless of distance except that it must be within the City boundary, has in my own case enabled me to dispose of practically the whole of the coke available for sale within our area of supply. There is no variation in the charge per ton with the size of coke, and deliveries are effected with our own lorries.

The market for tar while leaving much to be desired (especially in the case of vertical tars) is on the slow upgrade, and with the continued propaganda of "British Tar for British Roads" one looks forward to the future with great expectations. Sulphate of ammonia might be reasonably described as a mixed blessing in an agricultural district such as Hereford. No difficulty is experienced in obtaining a ready market for neutral dry salt—in fact, I have two or three merchants who can take the whole output. We pack in cheap sacks, as most of the deliveries are taken by road vehicle from our store. The disposal of effluent is a problem in a City blessed (?) with a well-known salmon river; sometimes I have wished for a black country stream where, perchance, a little contribution from the gas-works would not be out of place (I say this with all respect to the black country Engineers).

Our system of sulphate production is practically a continuous one throughout the year; this enables a continuous discharge of effluent to the public sewer, together with a considerable dilution by well water. The sewage treatment is by bacteria beds.

Works Maintenance.

I think the day when Gas Engineers had a "clean and brush up" every few years, especially when anticipating a visit, has given way to systematic cleaning and painting of all plant, and the use of paint spraying machines has been an advantage to many of us. I am a believer in a clean yard, and I consider the small cost of a weekly brush up is amply repaid. Present day competition and the freak habits of the clerk of the weather have made us all mindful of the general condition of our plant—more especially the stand-by units. The regular examination of retort settings, especially the waste gas and CO flues, is very necessary. Motors normally idle should be run at intervals; we make a point of frequently using all duplicates of machinery. Exhausters and district governors are examined and changed over weekly; gasholder crowns, guide rollers, and grips are regularly examined; and occasional fire practice is carried out. My Committee have adopted a policy of setting aside a sum annually to meet the cost of re-setting retorts—a policy which I believe is generally in operation throughout the country.

Mains and Services.

The cost of mainlaying in recent years has been considerably reduced. The earlier cast-iron pipes in 9-ft. lengths have given way to longer lengths with flexible joints, while steel tubes in long random lengths have been largely used, especially in districts where the ground is free from ashes and chemical waste. Where possible, I lay all mains dead, and, generally speaking, use steel tubes coated and double wrapped outside and oiled inside, and with inserted joints for welding, the pipes and joints being tested at a pressure of 50 lbs. per sq. in. At the time of writing this Address I am engaged in laying nearly a mile of 6 in. spun-iron pipe. This will enable me to make a very careful comparison between iron and steel mains. I think most of us have derived great benefit from the Specification of the Institution of Gas Engineers for genuine puddled-iron tubes. It has been the means of affording the best possible material hall marked by the I.G.E. Certificate. In the case of service connections to steel mains, I consider the double expansion nipple has filled a long felt want. I also desire to pay tribute to the work of the Corrosion of Pipes Sub-Committee.

Meters.

With regard to meters, much could be said about the merits or demerits of the slide valve *versus* the radial valve; but I do not propose to dilate here on the good points of either type. The introduction of the "Ducoin" meter has been an advantage in many districts, but I respectfully suggest that the added gearing is a mixed blessing; to my mind, the simpler the mechanism the lower the maintenace costs. If a slot meter was used exclusively by a mechanically-minded consumer I am all for the "Ducoin" type; but one has to cater for the type of consumer who may use a bent coin or uses force to insert the coin, both of which are distinctly detrimental to the prepayment mechanism. I am also doubtful whether the open-top meter is a step in the right direction. The selection of the type of meter to be used should, in my opinion, be carried out with the utmost care, as I am convinced that we are largely dependent on the accuracy of our meters for the safeguarding of our balance-sheet. May I refer to the excellent work of the Meters Committee of the Institution and the loyal co-operation on the part of the manufacturers.

Cookers.

I could say a great deal about cookers, and, at the outset, make no apology for being a strong advocate of simple hire. In the days gone by when our Industry had little or no competition to meet, one looked forward to very frequent sales of cookers; but I submit that the position to-day is vastly different. We have to compete with the all-enamel electric cooker, which, in my district, is offered free of hire, and, whatever claim can be made for the advantages of one type of fuel over another, the fact remains that the modern housewife is " all out " for modern apparatus. Some years ago I advised my Committee to offer a modern partly enamelled cooker on simple hire; and what has been the result of this venture? Of the 7,001 consumers we had on our books at March 31 last, 5,495 had cookers on hire (this figure obviously excludes privately owned or cookers on hire purchase), and of the 5,495, 1,806 were modern partly enamelled cookers.

We offer any make of cooker on generous cash or hire purchase terms; but I contend that we must be prepared to meet the consumer who is not in a position to purchase, and if we fail the competitor will step in, and the old saying will be surely ever true: " It is easier to lose a consumer than to regain one already lost."

For four years I have kept a record day by day and month by month of the gas output during every three hours of the 24 and compared it with the corresponding figures for the previous year, and I am happy to record the fact that the cooking load has increased and is increasing despite the fact that the modern cooker is a more economical unit. Sir David Milne-Watson at a meeting in London some 15 months ago said: " An inefficient gas appliance of whatever sort, such, for example, as the ugly old-fashioned black cooker is a source of weakness not only to the undertaking which leaves it unreplaced, but also to the whole gas army. A loss, a defeat, on any part of the line is a menace to the whole, and every weak spot, however insignificant it may appear, is a danger point." Sir Francis Goodenough, in a paper entitled "Essential Factors in the Promotion of Gas Sales " presented to the Victorian Gas Industry during the recent Centenary Celebrations, said: " Every out-of-date and inefficient appliance on the district is a danger point, an opening for a competitor to step in and give a better result." I contend we must scrap the " danger points " now. If my Committee could borrow money over a longer period of years I should unhesitatingly advise them to pursue the policy of scrapping black cookers at a much greater rate.

Gas Fires and Hot Water Units.

I think the gas fire of to-day is one of the most efficient heating units obtainable. The research during recent years has eliminated many undesirable features; the discovery of the means of giving the infra-red rays has been a great step forward, and I am certain that the Industry has a great future before it in the heating field. The introduction of colour finishes, built-in fires, automatic lighting devices, and portable fires with plug-in connections contribute to the selling points. Again I plead for simple hire as a means of increasing business. My own experience has clearly shown that the hiring of gas fires is a successful means of meeting competition.

The use of gas heated hot water apparatus is rapidly coming to the fore. The low consumption units lend themselves admirably to a daily-all-in-charge system and, with gas at a special hot water rate, offer an attractive proposition. I am an advocate for a special rate for gas (separately metered) for hot water units, and in two cases I have secured the heating of large buildings by hot water radiators served by gas-fired boilers, where solid fuel was a keen competitor. In my own case, the special rate of 6d. per therm does not apply to either geysers or washboilers. The flexibility of gas as a fuel is very clearly demonstrated in the hot water field, especially in a country where the climate is so changeable. We must search every corner for this potential load; rigid canvassing, and demonstration rooms will contribute largely to our success and we must HAMMER HOME: (1) The low cost of our product by comparison B.Th.U. for B.Th.U. with competitive fuels, and (2) The flexibility and cleanliness of gas. I like the B.C.G.A. poster " Really hot water," and it is surprising how many people (except gas consumers) do not get really hot water from their various systems.

Lighting.

The lighting load lends itself to a great deal of discussion, and my mind goes back to the inspiring Presidential Address of Mr. H. J. Woodfine in 1931. I listened to that Address very carefully, and I am fully satisfied that gas lighting is coming into its own through the modern lighting fittings, switch control, and careful maintenance. The careful attention to the composition of our gas is, in my opinion, even more important than calorific value. The variation in the structure of the flame, especially the inner cone, has in the past been a difficult problem for the lighting burner to overcome, and one frequently had complaints to attend to. To-day, however, with more modern plant the position is entirely altered, and it is seldom that burners need adjustment. I have recorded the orders brought in by our service fitters, and in ten months, in which time they have traversed less than one-quarter of the City, they have passed in 93 orders for lighting fittings; this is surely a sign that gas for lighting is holding its own.

I am a great advocate of gas for public lighting and have fought to retain this load. I am pleased to say that the Lighting Committee of the Hereford City Council have instructed the Lighting Superintendent to prepare a scheme for re-lighting the centre of the City, together with a five years' campaign for the improvement of lighting generally. Practically the whole of the City is gas lighted, the principal thoroughfares being lighted by 1,000, 1,500, and 2,000 candle-power Keith high-pressure lamps. The accompanying photographs, taken between 11 p.m. and midnight, show: (1) Commercial Road (2,000 c.p. lamps); (2) Commercial Street (1,000 c.p. lamps); and (3) High Town (1,500 c.p. lamps).

The remainder of the public lighting is by lamps varying from 2-light No. 2 conversion fittings to 16-light " Littleton " lamps at main corners and crossings. As a Department we maintain the lamps at an inclusive charge per lamp per annum, and, with few exceptions, all are lighted by pressure wave controllers.

I may say in passing that I brought several members of the Lighting Committee to see the lighting of Paradise Street and Victoria Square, Birmingham, and they quickly decided that gas was the illuminant for Hereford. I think the Industry as a whole, and more especially the Midlands, owes a great deal to the City of Birmingham Gas Department for their magnificent examples of public lighting. There is no better advertisement for gas than good public lighting, and I shall strain every nerve to keep the streets of the City of Hereford gas lighted.

Industrial.

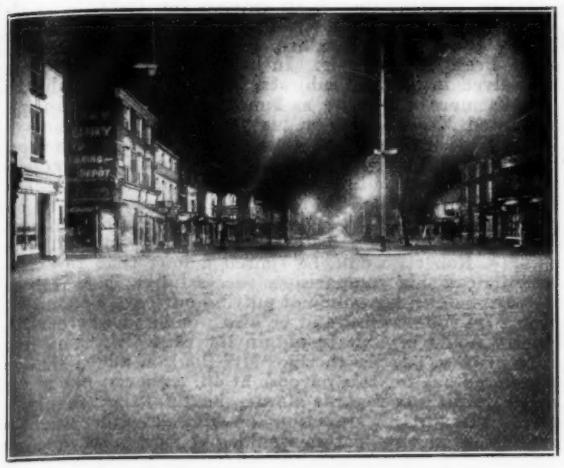
As an industrial fuel gas is ever to the forefront, and although my Department serves an agricultural City, we have two industrial consumers (tile works) who take some 30 millions per annum and a load which is constant throughout the year. I watch with great interest the development in gas furnaces, and I desire to emphasize the great value of the Industrial Gas Development Centres which have been formed to assist all of us in dealing with unusual industrial gas problems. I have made use of the Birmingham centre on several occasions and certainly derived great benefit from it.

Service to the Consumer.

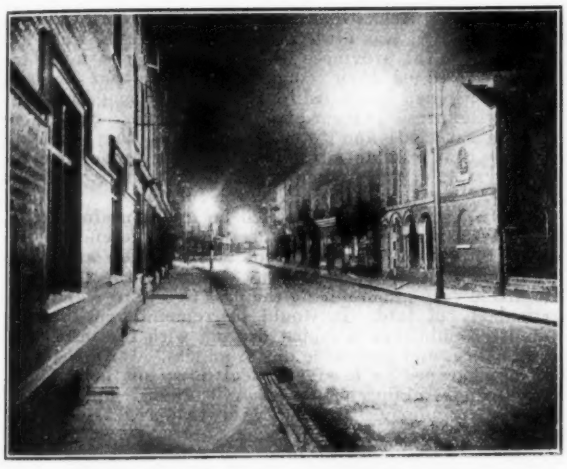
After studying all the problems of the manufacturing side in order to produce a cheap therm, we come to what I consider to be one of the vital problems—viz., service to the consumer. By this I mean not only service before sales but primarily service after sales. How many of us pride ourselves on having sold or put out on simple hire a large number of gas consuming appliances, particularly gas fires, and how many of us ensure that the appliances are in good order and being used regularly? I know that many undertakings run a maintenance scheme, but does not this scheme apply to lighting burners only? I am convinced that we must make a regular service call at every house and shop in the whole of our area and satisfy ourselves that the consumer is using the apparatus, getting satisfactory service from the apparatus, and is in a position to discuss the installation of further apparatus.

Some twelve months ago I recommended my Committee to appoint two uniformed service fitters whose duties were to call at every house to take a census of all gas and competitive apparatus, and adjust and clean burners, gas fires, &c., without charge, the consumer only paying for any material used. My objects were to satisfy myself that the Department was receiving the maximum amount of consumption from apparatus already fixed, giving the consumer's apparatus regular inspection, and introducing new apparatus and getting the public generally gas-minded. Every call is preceded by a letter of introduction. The scheme has been well received, and the service fitters have found many cases of faulty apparatus which the consumers were endeavouring to use rather than complain (a very real danger to our prosperity); and, in addition to obtaining a most valuable census of apparatus, they have brought in no less than 832 orders made up as follows:

Gas fires	55
,, cookers	95
,, boilers	23
Hot water units	14
Lighting fittings	93
Various other orders	552



Commercial Road, Hereford.
2,000 c.p. High-Pressure Lamps.



Commercial Street, Hereford.
1,000 c.p. High-Pressure Lamps.

High Town, Hereford.
Two 1,500 c.p. High-Pressure Lamps.

To refer again to Sir Francis Goodenough in his paper presented to the Victorian Gas Industry Centenary Celebrations, he makes specific reference to the value of a census scheme in these words: "The value of such a census scheme has been proved up to the hilt. Not only does it provide a complete record which serves as the groundwork for all subsequent sales activities; not only does it increase the goodwill of consumers; it also pays its way by the immediate sales which are secured."

I consider the scheme to be a sound investment; so much so that I have advised my Committee to appoint a third service fitter. The men are all practical gasfitters and can carry out small repairs; they use an attaché case to carry their tools, dusters, fuel, mantles, and literature, and look smart in their dark blue uniform, the cap of which has the City coat-of-arms.

During the past twelve months we have had a record run of district work, especially on hot water installations and cookers, and I attribute a great deal to the publicity given by the service fitters. In addition, we have carried out several advertising campaigns in the local Press and sent periodical seasonal literature to consumers. I should like to refer to the B.C.G.A. Salesmen's Course. This course is certainly an advantage to the showroom salesman, as it encourages him to work out his own sales policy. My showroom salesmen have taken it up, and I am certain they are more alive to the merits and advantages of gas. The publicity side of the B.C.G.A. has been encouraged by the higher rate of contributions from its members; the various poster campaigns are, in my opinion, a step in the right direction. It is certain that, as an Industry, we must hammer home the advantages of gas, and every effort must be made to get and keep the public gas-minded by poster advertising, regular distribution of literature of an interesting type, and talks to the public through clubs and other organizations.

Dare I tread on thin ice for one moment and say with all respect that we still suffer from a certain amount of apathy? I honestly believe this is our keenest competitor where it exists. We must not be content to sit still and wait for business. In an interview I had some four months ago with a builder who had purchased a building site and came to discuss the question of gas supplies, I asked if I could have detailed drawings of his proposed houses and quote for gas fires and hot water units. His reply was: "I have been in the building trade for 37 years, and you are one of the very few Gas Engineers to ask me to install gas fires and hot water units." Well, gentlemen, this is surely an example of apathy at its worst; and while I do not for one moment pretend to set myself up as an example, I do want to stress the point that we must keep our own house in order and seek every avenue for business.

Gas Unit and Tariff Systems of Charging.

I am all for the Gas Unit of 4,000 B.Th.U. To my mind it presents to the consumer a ready means of comparing the relative values of gas and electricity. The optional two-part tariff system of charging for gas is a subject calling for the most careful study. I see in it the possibility of a great future for gas; but the system must offer advantages to the consumer. We must face this all-important problem courageously, and I submit that it is up to each one of us to set to work and evolve our own schemes. As the nucleus of a report on this question, I have already taken out information (some months ago) on the consumption per consumer classified under different headings, and it may be of interest to you if I give the figures:

Consumption of—	No. of Consumers. Ordinary.	Prepayment.
Under 10,000 c.ft. per annum	194	670
Over 10,000 and under 25,000 c.ft. per annum	537	2,575
,, 25,000 ,, 50,000 ,, ,,	692	1,457
,, 50,000 ,, 100,000 ,, ,,	312	112
,, 100,000 ,, 200,000 ,, ,,	145	—
,, 200,000 ,, 400,000 ,, ,,	30	—
,, 400,000 ,, 600,000 ,, ,,	8	—
,, 600,000 ,, 800,000 ,, ,,	4	—
,, 800,000 ,, 1,000,000 ,, ,,	3	—
,, 1,000,000 ,, 10,000,000 ,, ,,	3	—
,, 10,000,000 c.ft. per annum	2	—

At the present time my Committee give a rebate to large consumers based on the following scale:

Consumption of—	Net Price per 1,000 C.Ft. s. d.
Less than 222,222 c.ft. per annum	3 9
Over 222,222 and under 444,444 c.ft. per annum	3 2½
,, 444,444 ,, 666,666 ,, ,,	3 0
,, 666,666 ,, 1,000,000 ,, ,,	2 9¾
,, 1,000,000 ,, 6,000,000 ,, ,,	2 5¼
,, 6,000,000 ,, 8,000,000 ,, ,,	1 8
,, 8,000,000 ,, 10,000,000 ,, ,,	1 7
,, 10,000,000 c.ft. per annum	1 6

Education.

It is of great interest to read how beneficial the Education regulations 1933 revision have been to all concerned, the important amendment seems to be concerning the entry to the Diploma Examination; the high standard of

education necessary for the present day Gas Engineer is in my opinion a great asset to the Industry.

Recent Legislation.

The Gas Undertakings Act, 1934, while not giving the Industry many of the desired privileges, has many good clauses. It gives further powers as to cutting off supplies on default of a consumer; provides that a person is not entitled to demand a stand-by supply of gas without payment in respect of such stand-by. One highly debated clause in the Bill for the Act was that which makes it unlawful for any local authority to insert in the tenancy agreement of any house which they own, and which is situated within the area of undertakers who are not a local authority, a provision restricting the right of any owner or occupier of the premises from taking a supply of gas.

The Hereford Undertaking.

As a conclusion to my Address, I am taking the liberty of giving you an outline of some of the more interesting early details regarding the Works I have the privilege to control. In 1824 the old Hereford Gas Company first came into existence; but in the early part of that year, at a meeting called to discuss the formation of a Gas Company, the late Mr. Thomas Davies—a disciple of Caxton—condemned with desperate vigour the attempt to introduce a novel system of illumination. This gentleman in his speech filled the minds of his susceptible audience with alarming predictions of the disaster which the adoption of gas must bring upon the business of the tradespeople, and appealed to them with truly patriotic ardour to reject a scheme which would involve the ruin of the "Greenland fisheries." It is doubtful whether it was the patriotic zeal on the part of the people of Hereford for the preservation of the Greenland fisheries or the powerful eloquence of the speaker which prevailed, but, one or both combined with the general prejudice of the multitude carried the day, and, a resolution requesting the establishment of a gas-works in the City was rejected in favour of an amendment to the contrary effect and the people went home in the darkness which they had determined to preserve, rejoicing that they had saved the Greenland fisheries and the Hereford tallow chandlers from simultaneous destruction.

However, as I have previously stated, the original Hereford Gas Company was formed in 1824, and operated until 1872, when the City Council acquired the Undertaking for a sum of £53,225. It is interesting to recall that a sum of £861 was paid for each £100 of share capital. I regret I was not a shareholder! The Council operated the Works, which were situated in Commercial Road, until 1878, when they launched a scheme for the removal of the Works to the present site in Mortimer Road. Of the plant then erected, two gasholders are still in regular use. The gas-making plant has been twice replaced by more modern systems. I should like here to recall the fact that my present Chairman (Mr. Alderman Witts) was elected a member of the Gas Committee in 1886 and Chairman in 1905, and has held the office ever since.

No outstanding events were recorded beyond replacements of plant until the difficulties of the war years 1914-1918, and afterwards the long coal strike of 1921, when on one occasion as darkness fell only two hours' stock of gas remained in the holders. During more recent years, carburetted-water-gas plant, complete high-pressure gas plant, new offices, stores, and showrooms have been provided, and, lastly, vertical retorts, coal and coke handling plant, and coal store, &c., have been installed. I hope you will visit Hereford for the Spring Meeting, when I trust you will spend an interesting day. I again thank you, gentlemen, for the honour you have done me in electing me your President, and my Committee for the generous support they have promised me during my year of office. I hope at the end of my term you will be able to say, "Well done, Hereford!"

Vote of Thanks.

Mr. RAMSDEN, in proposing a vote of thanks to the President for his Address, observed that they had received what they had expected from Mr. Roberts when they elected him President—namely, a most able Address, dealing thoroughly with the affairs of the Industry. He would like personally to thank Mr. Roberts for the appreciation he had expressed in his Address of the work of the various Committees of the Institution of Gas Engineers and of the co-operation in the Midlands in particular and throughout the country they received from the Birmingham Gas Department, who were always ready to assist other undertakings. He also congratulated Mr. Roberts' consumers on the very low price for gas in Hereford. It would be interesting to know, he said, how many high-pressure street lamps Mr. Roberts had in Hereford.

Mr. T. H. POULSON (Stafford), in seconding the vote of thanks, said that he had known Mr. Roberts for many years; he thought they both entered the Industry at the same time and had kept up a close association ever since. He was therefore particularly pleased to see Mr. Roberts in the Presidential Chair. In his Presidential Address he had delved into many subjects, and they would value his remarks more and more as time went on. He also congratulated Mr. Roberts on his very good carbonizing results; 92·5 therms per ton of 450 B.Th.U. gas was an excellent ideal which they should try to attain. He noticed that Mr. Roberts had laid a lot of steel mains and was now laying nearly a mile of 6-in. spun-iron pipe, and had observed that this would enable him to make a careful comparison between iron and steel mains. They would all hope that Mr. Roberts would be spared a long time to enable him to draw his comparisons successfully. Mr. Roberts was very bold in his policy of putting out partly enamelled cookers on simple hire; and he also wondered whether Mr. Roberts would be able to obtain the central heating load at his price of 6d. per therm. Mr. Poulson added that he had offered gas for this purpose at 4d. a therm, but it was turned down. As regards storage heaters, they should be very careful in this direction; he himself rather thought that instantaneous heaters would give better service. In conclusion, Mr. Poulson said that he considered service to the consumer to be most important, and they would have to give more and more service in the future than they had done in the past.

Gasholder Inspection and Maintenance.

Mr. J. R. W. ALEXANDER, supporting the vote of thanks, remarked that it was always gratifying to learn what was being done in the provinces to maintain the position of the Industry *vis-à-vis* their competitors. On that occasion they had listened to an Address which, he suggested, was a simply expressed record of achievement, and if one could be satisfied—and to a large extent they could be satisfied—that similar advance was being made in every gas undertaking throughout the country, there would be no need for any misgivings as to the future.

There was one matter to which he might usefully refer, and that was in regard to the President's reference to gasholders. The question of gasholder inspection and maintenance had been exercising the minds of the Gasholder Committee very much during the past five years—and more particularly of late. It would be remembered that the Committee published a report dealing with the inspection, maintenance, and insurance of gasholders. With the question of insurance he need not deal now; but he did urge that gas undertakings should ensure that their holders were inspected regularly. It was wise to have issued that document. Lately they had had the misfortune to have to consider two gasholder accidents in different parts of the world, and from the investigations of their own engineers it was clear that the accidents were due to internal corrosion. The first report of the Committee did not deal with this subject as such; but it now appeared to the Committee that a report would have to be issued making suggestions as to how the internal condition of gasholders might readily be ascertained. They were tending to the view that wastage of the inside could not adequately be determined by external examination, so that a ready means must be found of ascertaining the interior condition if risks of accidents were to be avoided. This matter interested not only the Gasholder Committee, but was also of concern to the Home Office.

Continuing, Mr. Alexander observed that a Meters Specification was about to be issued. This had been drawn up in collaboration with the manufacturers, and while not dealing with the design or construction of meters or with the quality of materials, it did attempt to specify certain capacities and sizes to which it was suggested all future meters should be made. This gave engineers a suitable basis on which to consider future requirements. It was an attempt to reduce the multiplicity of sizes.

As regards lighting, Mr. Alexander said he would like to make a personal observation, because he thought that people like himself, who were not born and bred in the Gas Industry, perhaps saw things in a slightly different light. In connection with domestic lighting, it was wrong, he suggested, for the Gas Industry to install any fittings unless they were prepared to maintain them—for this reason, that the public largely judged gas by its lighting, and the sight of a bad gas lighting fitting might easily decide them to go over to electricity for the various heating loads as well, upon which they, in the Industry, knew that its future development depended.

Gas Charges.

In connection with gas charges, the National Gas Council were shortly to publish what he thought they would find an extremely interesting memorandum, reviewing the matter historically and dealing with two-part tariffs and

block rates. It was obvious to those who had to regard this question from the point of view of the country as a whole that there would have to be modification in the present system of charge. When one considered the relative advantages of the two-part tariff and the block rate one was faced with the difficulty of getting the consumer to pay a standing charge. It appeared extremely difficult; and yet when he took out statistics in connection with the electrical industry he found that 80% of company owned, and 88% of publicly owned, undertakings had two-part tariffs. If a consumer accepted a standing charge for electricity there was no reason why he should not accept a standing charge for gas. Thus, when talking to a consumer about the running cost of an appliance they could refer to the low cost of gas and ignore the standing charge—as the electrical industry did. He suggested that in future price was going to be increasingly the chief consideration in the sale of gas, and they would not be able to sell a gas appliance that was going to cost more to run than its electrical or oil counterpart.

In his Address Mr. Roberts had been good enough to refer to the Education Scheme of the Institution of Gas Engineers. Birmingham was a great centre in the provinces from the education viewpoint. The Education Scheme was undoubtedly a great success. Inaugurated over ten years ago, the increase in the number of candidates was from 40 in 1924 to 400 in 1934—which indicated some measure of the success of the scheme.

The vote of thanks to the President was carried unanimously, and in reply, Mr. ROBERTS acknowledged the kind way in which the members had accepted it. Referring to some of the points raised by the speakers, he stated that there were 28 high-pressure gas lamps in Hereford. They had taken on two central heating consumers at 6d. per therm. He was very interested to hear Mr. Alexander's remarks, particularly those in regard to maintenance and inspection of gasholders. At Hereford they had internally examined two of their holders in 1914, these being respectively 55 and 52 years old to-day.

An Invitation to Hereford.

Councillor BERNARD POWELL (of the Hereford Corporation Gas Committee), having apologized for the absence of his Chairman, referred to the fact that the latter had just completed fifty years' continuous service in the Corporation. Continuing, he remarked that Chairmen of Committees and members of Corporations had very little to do when they were blessed with good Officials. At Hereford they were blessed with a very good Official in their Gas Engineer and Manager, Mr. Roberts, and the members of the Gas Committee were very sincerely grateful to the Association for electing their Engineer and Manager as the President for the coming year. Not only could Mr. Roberts give a good Address, but he was also a very capable man, full of integrity and sound judgment. The Chairman of the Hereford Gas Committee had asked Councillor Powell to invite the Association to Hereford on May 16 next, when he earnestly appealed for a large attendance of members. Having referred to the fine gas lighting of Victoria Square, Birmingham, which they were trying to emulate at Hereford, Councillor Powell, in conclusion, thanked the Association again for the great honour they had done the Mayor and Corporation of Hereford by electing Mr. Roberts as their President.

Mr. RAMSDEN appealed to members to turn up in good numbers at Hereford to show their appreciation of the work of Mr. Roberts and his Committee.

Midland Commercial Gas Association.

Mr. F. C. BRIGGS (Dudley) then presented the Report of the Midland Commercial Gas Association. They had, he said, 76 members and had held meetings every two months, it having been as successful a year as ever.

Mr. H. DAVIES (Chesterfield) seconded the adoption of this Report, which was carried unanimously.

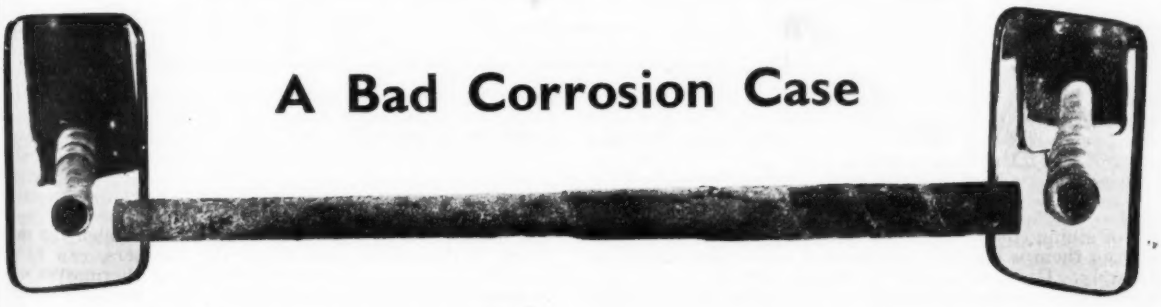
Mr. BRIGGS thereafter reported upon the work of the Midland District Education Committee, remarking that they had had no meetings during the year by reason of the fact that the Education Scheme was functioning so satisfactorily that it was almost automatic in operation. Nevertheless the Committee had done very useful work. Students wrote for advice which was given at once and was of great benefit to them. The Committee had been instrumental in getting an inspection of one of their most important schools where they thought the instruction was not as good as it should be. If any gas engineers had students, the Midland District Education Committee would do their best to form classes for their instruction. In the Gasfitting Examinations they were faced with the difficulty of not being able to find examiners in practical gasfitting, and he appealed to engineers to advise the Committee if there were any members of their staffs who could offer their services as examiners.

Mr. F. SHEWRING (Stratford-on-Avon) seconded the resolution for the adoption of this Report, which was unanimously carried; and the PRESIDENT expressed the thanks of the Association to Mr. Briggs for his work in connection with both these bodies.

On the proposition of Mr. RAMSDEN, seconded by Mr. W. G. S. CRANMER (Willenhall), Mr. Roberts was unanimously appointed to represent the Midland Association on the Council of the Institution of Gas Engineers.

It was proposed by Mr. POULSON, seconded by Mr. RAMSDEN, and unanimously agreed that the following be appointed to represent the Association on the Midland District Education Committee—namely, Messrs. A. Roberts, G. S. Eunson, F. C. Briggs, and W. G. S. Cranmer. This concluded the business of the meeting.

A Bad Corrosion Case



The protection of mains and services against corrosion is of such perpetual interest to the Gas Industry that we feel the accompanying illustration, which shows the result of a very severe test made at the Stepney Borough Council Electricity Works, will prove of considerable interest.

An iron tube 12 ft. long, and fitted at intervals with nozzles, was wrapped with " Densotherm " Bandage, and inserted in one of the Council's chimney stacks for the purpose of spraying water on to exhaust to minimize smoke emission. The working temperature of the furnace was 350° F., and the pipe was brushed every fortnight to remove soot.

After being in use for barely six months, it was observed that serious corrosion had rendered the pipe unfit for further use, and it was withdrawn for replacement, with the idea that the wrapping was unable to stand up to the job. On further examination, however, it was discovered that the wrapping had been insecurely fixed, with the consequence that one-half of the pipe had become uncovered, and this half had indeed corroded into perforations, while the other half had remained wrapped and was in perfect condition. The different thicknesses of the two halves can be clearly seen in our photograph, especially where the ends are shown reflected in mirrors.

For these interesting particulars we are indebted to Messrs. Winn & Coales, Ltd., of 40, Trinity Square, E.C. 3, who are the manufacturers of " Densotherm " Bandage, and also of the well-known " Denso " Wrapping for pipes which are not exposed to high temperatures.

DEVELOPMENT AND PERFORMANCE OF Thermostatically-Controlled Gravity-Feed Coke Boilers

by F. J. EATON, Ph.D.

This Paper was presented by Dr. F. J. Eaton, of the Gas Light and Coke Company, to the London and Southern District Junior Gas Association at a meeting on March 15.

INTRODUCTION.

Modern central heating practice demands that the boiler plant shall automatically maintain a predetermined temperature in all rooms of the building to be heated. To obtain this standard of perfection the boiler plant should fulfil the following requirements:

(*a*) The thermal output should be thermostatically controlled according to the heat required in the various parts of the building.
(*b*) Fuel should be fed to the boiler at a rate depending upon the heat output.
(*c*) It should be possible to operate the boiler continuously throughout the heating season without any break for clearing the fire box or cleaning the flues.
(*d*) The control of the thermal output and the rate of fuel feed should be automatic.

Of the fuels available, only gas and electricity are capable of giving completely automatic service, and the choice between them is largely a question of cost and availability of supply. Gas is definitely the cheaper fuel, and now that makers have realized that there is a market for gas fired boilers and that gas undertakings are in a position to offer attractive block rates there should be a considerable development in gas fired units.

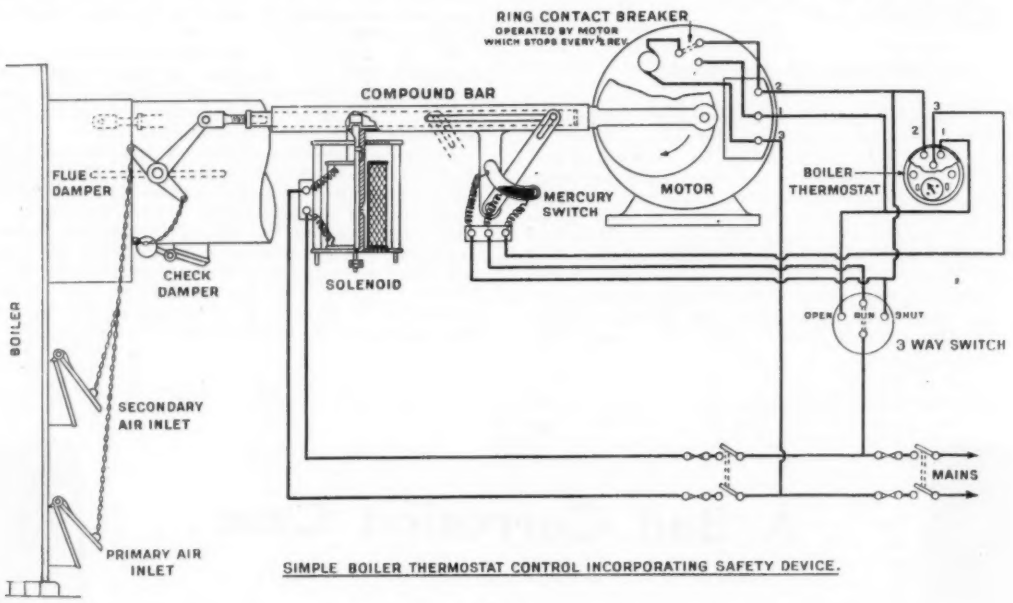
The introduction of oil fuel for central heating brought automatic firing and control within the reach of many who had in the past used hand fired solid fuel boilers. More efficient and flexible burners, automatic ignition, various safety devices to eliminate the risk of explosion to which this type of firing is liable, and special types of boilers were developed, until fuel oil was gradually replacing solid fuels. Oil occupies a position between the expensive fuels capable of complete automatic control and the cheaper solid fuels which required hand firing and control. The former were not completely automatic since in addition to the periodic cleaning of the fire box and flues, the various electrical safety devices and the correct setting of the burner required expert though fairly infrequent attention. The degree of automatic control obtainable with oil was rightly considered by a large number of people to be worth the extra cost over that of a hand fired installation.

This was the position, therefore, in 1931, when work was first commenced at the Fulham Research Laboratories on the development of a simple system of thermostatic control of combustion suitable for coke fired boilers.

Thermostatic Control of Combustion.

The early experiments carried out on a hand fired boiler fitted with forced draught showed that combustion can be readily controlled by this system. It is, however, expensive to operate and cannot be easily installed on existing central heating boilers, the majority of which are operated on natural draught. In the natural draught system evolved by Dr. R. Chaplin, the driving unit consists of a fractional H.P. motor which incorporates a reduction gear so that the final speed of the driving shaft is one revolution per minute. Fig. 1 shows the method by which the movement of the motor, and hence the dampers, can be controlled by means of a three-point boiler thermostat which is placed in the flow water service. The motor is provided with three connections, one of which passes direct to the mains, while the circuit is completed from either of the points 1 or 2 on the motor through two of the three connections on the thermostat. Each of the points 1 and 2 on the motor is provided with one automatic contact breaker so that if contact has become broken on point 1 and the thermostat moves over so that current flows to point 2 the motor will move through half a revolution before contact is again broken and the motor stops. Before any further movement can take place the boiler thermostat has to alter its position.

The automatic control of combustion on the hand fired boiler to which this system was first applied was by primary air and check draught damper only. The connections on the boiler thermostat and the position of the motor lever arm were adjusted so that when the boiler water exceeded



SIMPLE BOILER THERMOSTAT CONTROL INCORPORATING SAFETY DEVICE.

Fig. 1.

the thermostat setting the motor movement shut the primary air dampers and opened the check draught damper. With this system, therefore, the dampers are either open or shut. It was found that when a pressure bellows type of boiler thermostat was used, the boiler flow water temperature could be controlled within ± 5° F.

Attention was next directed to the control of the heat output of the boiler according to the heat requirements of the building. To provide such control, two methods, first by room thermostat and secondly by variostat, have been investigated.

Key-Room Control.

In this system, see fig. 2, a three-point thermostat, placed in a key position in the building, is wired to the boiler thermostat in such a way that the hot positions are connected in parallel while the cold positions are connected in series. Thus, when the key-room is below temperature, connection is made through the room thermostat and boiler thermostat to the motor, and the heat output of the boiler is limited by the setting of the boiler thermostat. When, however, the temperature of the room exceeds the thermostat setting connection is made directly through the room thermostat to the damper operating motor, and the primary air dampers if in the open position are shut and remain in this position until the temperature of the room again falls below the required value.

To demonstrate the utility of the key-room system of control, tests were made on the heating of a large building containing mainly office premises. The boiler, which was hand fired, was equipped with a boiler thermostat and fractional H.P. motor, and the control dampers were arranged so that when the primary air damper was opened a butterfly damper in the main flue was also open and the check draught damper was shut. Two tests of several weeks' duration were carried out. For the first test, without key-room control, the boiler thermostat was set each morning at 8 a.m. at a value determined by the formula:

$$tf\ ^\circ\text{F.} = 270 - 3\,te,$$

where tf is the required flow water temperature and te is the atmospheric shade temperature between 7 a.m. and 8 a.m. In the second test, a room thermostat was used and the boiler thermostat was set at 160° F. The results showed that the coke consumption per degree day with the boiler thermostat control was 0·738 cwt. and for the boiler thermostat *plus* room control 0·662 cwt., thus demonstrating a saving of 10·3% on the fuel used.

Variostat Control.

Control of the heat required to maintain a pre-determined building temperature may also be obtained by means of a variostat. This is a liquid filled system consisting of two bulbs connected through a single helical tube. One of the bulbs is placed in the boiler flow water service while the other is placed in a shaded position outside the building. The position of a three-point mercury switch which is attached to the helical tube and hence also the temperature setting of the boiler thermostat is varied in accordance with the atmospheric shade temperature. For example, the proportions of the variostat can be so arranged that when the outside air temperature is 30° F. the boiler flow water temperature is 180° F. A rise in the outside air temperature to 40° F. would with this instrument be accompanied by a fall in the temperature of the boiler water to 150° F. While no comparative fuel tests have yet been conducted, this type of control has been fitted to several large coke burning installations, and its performance in maintaining an even building temperature has proved satisfactory.

Safety Device.

With the system of open-shut motor operated damper control, should the current supply fail when the primary air dampers are in the open position the boiler water temperature will continue to rise. This rise is further accelerated by the fact that the circulating pump with which most systems are fitted will cease to circulate, and the water flow through the boiler will be by gravity only. To safeguard the boiler a special safety device was developed which not only places the dampers in a safe position, but when the current is again available the whole system is returned to normal working. The device consists of a compound bar, see fig. 2, and forms the connection between the driving motor and the crank connected to the dampers. In the form of the device, illustrated in fig. 2, the two portions of the bar are locked together by a pin which is held in position by a solenoid. On failure of current the solenoid falls a short distance under gravity and then hits the locking pin a sharp blow. The bar is then free to extend, and in extending it trips over a mercury switch. The function of this switch is to make connection to the motor so that when current is again available the bar is first closed, the mercury switch is returned to its normal position, and the thermostat once more takes control. Further, at Fulham we have fitted an automatic starter for the circulating pump, so that after a failure of circuit normal circulation can be automatically re-established as soon as the current supply is available.

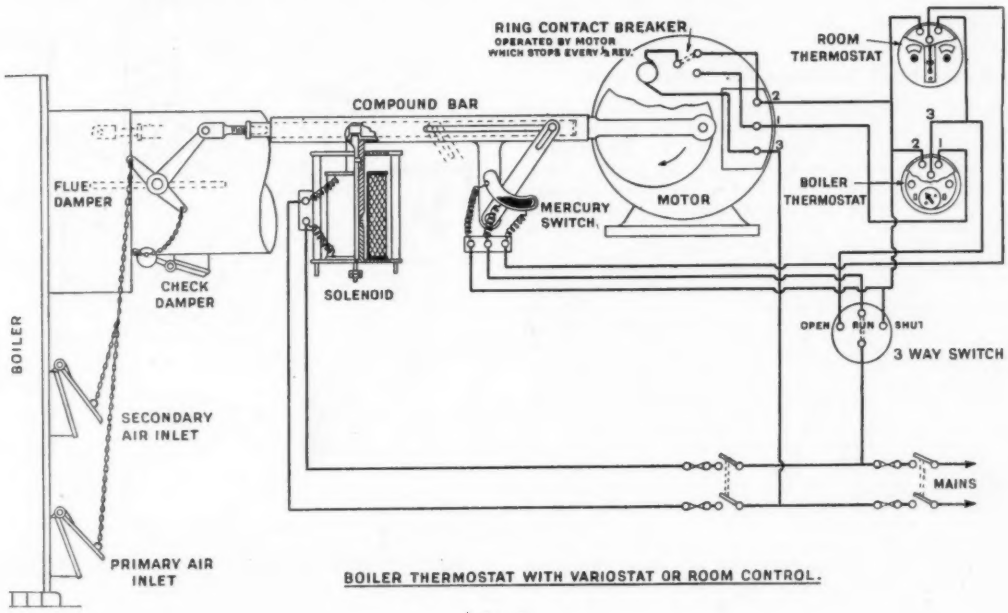


Fig. 2.

Reliability of Controls.

It may be suggested that the addition of thermostatic control makes the boiler equipment more complicated, and it has therefore been our aim to develop a system which can be supervised by the normal boiler room attendant. It will be realized that much depends upon the reliability of the thermostat employed, and prolonged tests have therefore been made on every item of the equipment before it is finally passed for general use. With regard to thermostats, our experience has been that the expanding tube type is in general more reliable than a thermostat which incorporates a pressure bellows. This later type has, however, been recently much improved. Makers have realized that the lever systems between the bellows and the contact

switch should be kept as simple as possible and that the moving parts should be protected from dust. A pressure bellows thermostat of a simple and effective type has been in use on one of our boilers for the last ten months. The same conservative attitude has been adopted with the various alternative systems for operating dampers. Following an extensive laboratory test, the reliability of the control is tested on a boiler plant to which access is available. This system ensures that where recommended control systems are installed, the customer is assured of trouble-free service.

Advantages of Thermostatic Control.

It has been proved that the addition to a hand fired coke boiler of the type of thermostatic control described above results in the more efficient heating of the building. The temperature of the building is maintained at a constant value, and since overheating is avoided the fuel is used to the best advantage. Moreover, the temperature control is automatic and requires no supervision on the part of the boiler room attendant. Clinker formation is reduced, and therefore the labour charges in connection with the boiler may be reduced, since less time is required to clean the fire. In connection with the efficient heating of a building, mention may be made of the addition of a clock control to the thermostat equipment. In heating the Fulham Laboratories, for example, the clock control cuts out the thermostatic control at 4.30 p.m.; the dampers are then in the shut position and the fire is banked up. It has been found that when the outside air temperature is not less than 40° F. the building will be up to temperature at 9 a.m. if the thermostatic damper control comes into operation at 5 a.m. No stoking of the fire is carried out until 7.30 a.m.

Automatic Feed Systems for Solid Fuels.

Following the development of the thermostatic damper control described above, two systems of automatic feed suitable for coke fired boilers were considered. These were, firstly, the underfeed stoker and, secondly, by gravity feed.

With the underfeed stoker, the fuel is conveyed through a tube by a screw from a hopper situated outside the boiler to a small fire pot placed inside the combustion chamber. Both the air required for combustion, which is supplied by a fan, and the rate at which the fuel is conveyed to the fire pot may be thermostatically controlled. The fuel in the gravity feed system is fed from a hopper contained in the boiler on to a sloping grate. The "Spencer" and the "Newport" boilers in America and the "Ideal Universal" or "Rex" boilers in Germany are examples of boilers which incorporate this system of feed.

After a series of tests on one type of underfeed stoker, it was decided to concentrate on the hopper feed system for which the available supply of accurately graded coke seemed particularly suitable. Other factors such as the low working efficiency obtained when either coal or coke is used with the underfeed stoker and the necessity for a power driven unit contributed to this decision. It should be emphasized that the hopper feed system will only operate satisfactorily with accurately graded non-caking or feebly-caking fuels. Uneven grading produces bridging in the magazines, while a caking fuel bridges the mouth of the fuel chute, both of which prevent the flow of fuel to the grate.

Critical Dimensions of Gravity Feed Boilers.

The dimensions of the coke-fired gravity feed boiler were arrived at after exhaustive tests on a "Spencer" boiler which had been imported from America and modified to suit our requirements. In this boiler (see fig. 3) the fuel is fed from side magazines on to a V-shaped grate, each side of which slopes at an angle of 25° with the horizontal. For nut coke the magazine is $5\frac{3}{8}$ in. wide, while the perpendicular distance from the grate to the curtain wall is 10 in. A division plate at the peak of the V subdivides the ashpit, and this in conjunction with the duplication of primary air and secondary air dampers allows combustion to take place on half the grate should a lower output be required.

Additional hopper space constructed of cast iron was built into the boiler to provide sufficient fuel to last for 24 hours at full load. This hopper was fitted with a heavy cast-iron sliding door, and the surface was machined to make it as air-tight as possible. It was found important to subdivide this hopper, so that should the fire burn more rapidly on one side of the grate than the other, and the fuel fall below the curtain wall, no circulation of gases would take place and cause combustion in the magazines.

Width of Magazine.

For the satisfactory flow of fuel down the magazines and on the grate the width of the magazines, the distance of the curtain wall from the grate, and the angle of the grate have to be carefully chosen with relation to the size of fuel used. For broken coke—*i.e.*, 1 to 2 in. mesh—the width of the magazines has to be increased to 8 in., and the distance of the grate from the curtain wall to 12 in. It will be noted that the depth of the fuel bed at the curtain wall is for nut coke $8\frac{3}{4}$ in., and for broken coke 10 in.

Grate Angle.

To determine the most suitable grate angle a special adjustable grate was made. The results of these experiments are interesting, since they demonstrate quite conclusively that with nut coke and where the fire bars are parallel to the flow of the coke the angle of the grate with the horizontal should be 25°. If the grate angle is increased to 30° the coke from the magazines slips to a greater extent and in doing so pushes the ash to the centre of the fire. In time the accumulation of ash prevents combustion and

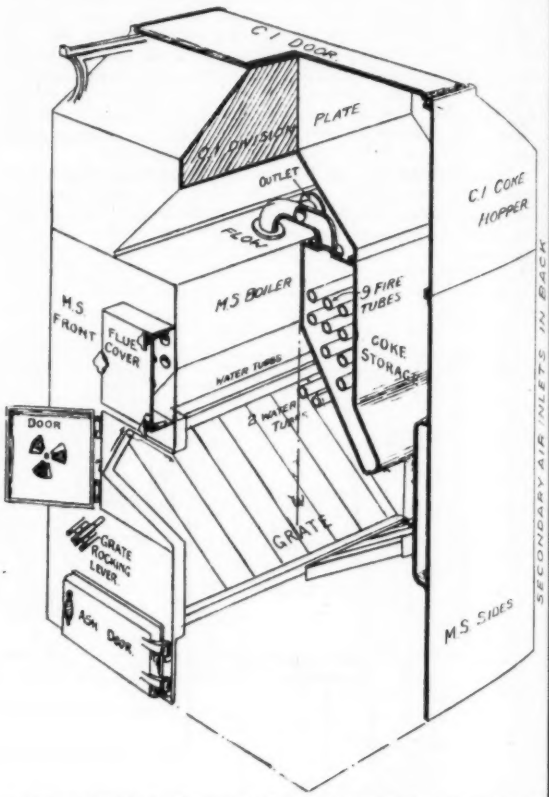


Fig. 3.—Modified "Spencer" Boiler, designed for attention once in 24 hours.

the centre of the fire goes dead. Thus with a 25° grate angle a uniform combustion rate over a 24 hour period of $3\frac{1}{2}$ lbs./sq.ft. grate area/hour can be maintained, and this is reduced to $2\frac{3}{4}$ lbs. when the grate angle is increased to 30°.

With broken coke a grate angle of 30° has been found to be satisfactory. Since these grate angles are less than the natural angle of repose of coke the fuel bed depth decreases gradually towards the mid-point of the grate. When nut coke is used on a grate measuring 22 in. from the magazine to the centre of the V the fuel bed depth falls from $8\frac{3}{4}$ in. to about 6 in. The fuel bed depth with broken coke on a grate measuring 2 ft. falls from 10 in. to approximately 7 in.

Performance of Gravity Feed Boilers.

The satisfactory performance obtained with this boiler is due to the combination of the continuous feed giving a fuel bed of uniform thickness and the thermostatic control of combustion. Much also depends upon the correct setting of the dampers. With the open-shut system of damper control previously described, when heat is required from the boiler, the final shaft of the motor moves through half a revolution.

Reference to fig. 2 will show that this movement of the motor opens the butterfly damper in the main flue, opens the primary and secondary air dampers, and closes the check draught damper. Thus the full chimney pull is available, causing air to flow through the primary air

dampers to the fuel bed and also through the secondary air dampers to the fire box. When the boiler water reaches the required temperature the motor again moves through 180°, and the reverse operation takes place. In setting the dampers it is usual to operate with a pull of 0·15 to 0·20 in. W.G. when the primary air dampers are open and of 0·02 to 0·04 in. W.G. when the primary air dampers are closed. Both figures refer to the gauge reading taken at the back smoke box and with the fire clean. A segment should be cut from the lower half of the butterfly damper, so that when it is in a vertical position there is still a passage way for the flue gases. Finally, the secondary air damper setting is adjusted so that when the primary air dampers are open and the fire is clean the flue gases contain 16% to 17% CO_2. The setting of the secondary air dampers is important, since the fuel bed depth, which depends upon the size of fuel used, is such that carbon monoxide is always produced, and secondary air is required to convert this to CO_2. While it is possible by accurate setting of the dampers to get 18% CO_2 in the flue gases before any CO can be detected by means of an Orsat apparatus, it is preferable to work to the figure of 16% to 17% given above.

It has been stated that the force available to introduce air into the boiler acts on both the primary and secondary air inlets. Now as the period for cleaning the fire increases, there is a gradual accumulation of ash in the fuel bed, its resistance to the flow of air is increased, and in consequence more air enters through the secondary air openings. This results in a gradual lowering of the CO_2% in the flue gases. In addition, the time during which the primary air dampers are open or shut gradually changes. By way of example, the following figures obtained on a boiler operated at 60% of its rated output may be given.

Variation of CO_2, % in Flue Gas.

Period.	Primary Air Dampers.			
	Open.		Shut.	
	CO_2. %	Temperature, ° F.	CO_2. %	Temperature, ° F.
3 p.m.–12 midnight .	15·5	493	12·8	275
12 midnight–6 a.m. .	12·6	446	11·1	262
6 a.m.–11 a.m. . .	12·0	482	11·2	273
11 a.m.– 3 p.m. . .	10·6	462	7·5	284

Operation of Dampers.

No. of Hours from Clinkering and De-Ashing.	Time in Minutes. Primary Air Dampers.	
	Open.	Shut.
3	10	19
12	11	17
18	14	14
24	18	12

Maximum Combustion Rate.

The degree of automatic operation which has been aimed at is that the grate shall be cleaned only once in 24 hours. The maximum combustion rate is therefore the weight of coke which can be burnt per unit of grate area when the grate is cleaned once per 24 hours and the heat output of the boiler is maintained at a constant level.

With a gravity feed boiler using nut coke containing 10% of ash the maximum combustion rate is 3·5 lbs./sq.ft. of grate area/hour, and this rate also applies to boilers fired with broken coke. The limiting factor for the combustion rate is the gradual accumulation of ash of which in this type of grate only 1 to 2% falls automatically through the fire bar spacings. It therefore follows that by cleaning the fire more frequently than once in 24 hours higher combustion rates can be attained. The chimney draught required to obtain these results is 0·15 to 0·2 in. water gauge.

Recent experiments have shown that at least 5 lbs./sq.ft./hour can be burnt satisfactorily on a boiler of ½ million B.Th.U./hour output, and of which the fuel bed is only cleaned once in 24 hours. This increase is due, first, to the fact that some 40% of the ash falls through the fire bar spacings automatically, and, secondly, to the use of a specially designed water cooled grate.

Efficiency Tests.

A large number of efficiency tests have been carried out on a gravity feed boiler using nut coke, and the results are shown graphically in fig. 4. Each test extended over a period of 24 hours, and the output of the boiler was maintained at a constant level by means of the thermostatic and damper control. It will be noted that at the maximum combustion rate of 3·5 lbs./sq.ft./hour the output was 330,000 B.Th.U./hour and the efficiency was 71%.

The efficiency curves given also show that for an increase in output from 198,000 B.Th.U. to 330,000 B.Th.U. per hour the boiler efficiency only decreases from 76% to 71%.

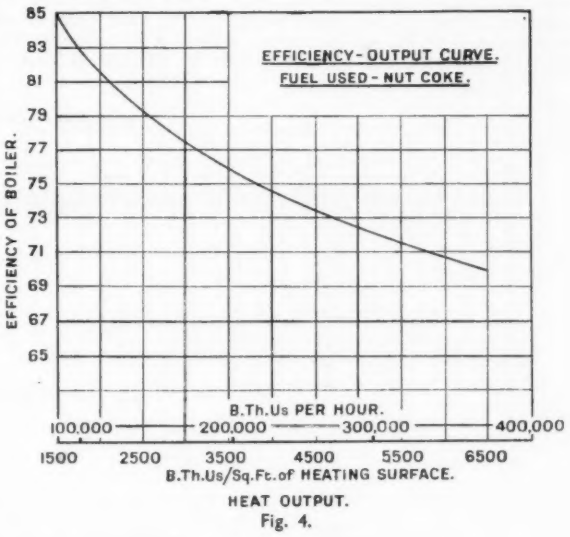


Fig. 4.

This is a matter of considerable importance because of its influence upon the efficiency of the boiler under normal working conditions, in which considerable variations in load take place. If it is assumed that a boiler throughout the heating season is operated on an average at 60% of its rated value, then the working efficiency of this gravity feed boiler will be approximately 76%.

Equally high efficiencies have been obtained on one gravity feed boiler of a rated output of one million B.Th.U. per hour which was fired with broken coke. The rating of this boiler is 5,250 B.Th.U. per sq. ft. of heating surface, while that of the gravity feed boiler fired with nut coke was at the maximum combustion rate—5,800 B.Th.U. per sq. ft. At an output of 60% of the rated value, the efficiency of the boiler was 77%, a figure which compares favourably with that obtained on the gravity feed boiler, fired on nut coke. Boiler efficiencies of 80% have been obtained at combustion rates of 4½ lbs. per sq. ft. of grate area per hour on a gravity feed boiler which incorporates a special type of water cooled grate.

Flexibility of Output.

In several central heating systems, the boiler not only supplies heat to the building but through a calorifier also supplies the hot water requirements. To do this, the boiler water is run at a high temperature, and the required temperature of the water circulating round the building is controlled by allowing a certain proportion of the return water to by-pass the boiler. The circulation of

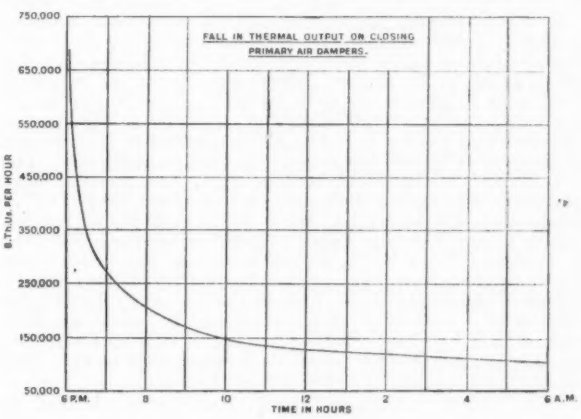


Fig. 5.

water through the boiler therefore varies with the proportion of return water which is by-passed, and the rate of heat output from the boiler must be controlled so that the boiler water temperature does not become excessive.

Fig. 5 shows the rate at which the output falls in a gravity feed boiler of 1 million B.Th.U. rated output

which was fired with broken coke. Close attention to the setting of the dampers and to the fit of the primary air dampers and the ash pit doors is essential if similar results are to be obtained. In this case, when the primary air dampers were shut, a gauge placed in the back smoke box registered 0·01 in. water gauge. While a decrease in the output from 686,000 B.Th.U./hour to 312,000 B.Th.U./

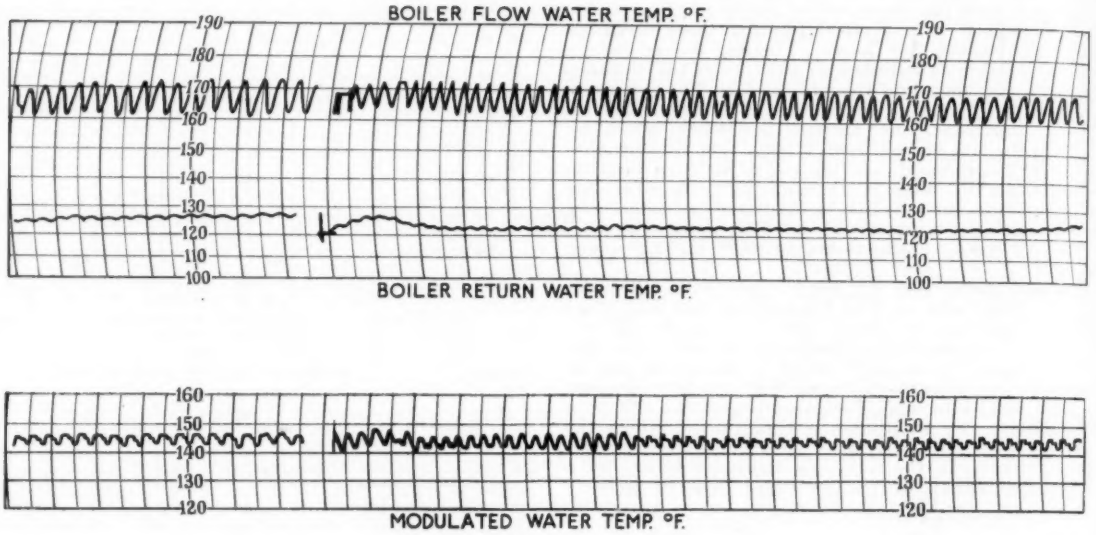


Fig. 6.

hour in 30 minutes following the closing of the primary air dampers is normally sufficient to prevent an excessive rise in temperature, it is advisable to include a relief valve in the system. In fig. 6 is given a thermograph record taken during a test, in which a modulator valve was coupled directly to a gravity feed boiler. A special modification of this mixing valve is now available in which the centre of the three ports is arranged to be magnetically closing to the boiler water, and this port is also operated as a relief valve by means of a limit thermostat placed in the boiler water flow service.

British-made Gravity Feed Boilers.

The "Gravico" Boiler.

The first welded steel gravity feed boiler made by Messrs. Hartley & Sugden was installed at the Architectural Association in the autumn of 1933, and the installation at Imperial College followed soon after. From the large number of inquiries which resulted, it was evident that there was a considerable market for an automatic coke burning boiler. Development was, however, delayed, as it was found that the boilers were too high to fit into the majority of existing boiler rooms. Steps were therefore taken to reduce the height, first, by reducing the fuel storage to an 18 hours' supply at full load, and, secondly, by increasing the width of the boiler. It has been found that 18 hours' storage is sufficient for average working conditions. The "Gravico" boiler illustrated in fig. 7 has recently been installed at Fulham. It has a capacity of 600,000 B.Th.U./hour, and the dimensions are 5 ft. 7 in. high, 5 ft. 6 in. wide, and 5 ft. 7 in. long. Since experience with the 2 million "Gravico" boiler installed for Winchester Cathedral has shown that a fuel bed 7 ft. 6 in. long can be cleaned satisfactorily, it follows that a boiler having an output of 1 million B.Th.U./hour can be made which is only 5 ft. 7 in. high. Such a boiler can be installed easily in the existing boiler rooms in London and at the same time leaves ample room for overhead storage.

The Fulham "Gravico" boiler has a water bridge, so that the products of combustion pass to the back of the boiler, return to the front smoke box, which is recessed, and finally escape to the main flue through the fire tubes. It is anticipated that by this means the heat loss from the front smoke box which on a previous boiler amounted to 33% of the total loss, will be considerably reduced. The outer water jacket has been extended to the magazine door so that the fuel storage space is now an integral part of the boiler. In common with all "Gravico" boilers, the outer casing is of planished steel, with chromium-plated angles and fittings.

The "Ideal Magazine" Boiler.

The choice of gravity feed boilers suitable for burning coke has been increased by the decision of the Ideal Boiler and Radiator Company to market the "Ideal Magazine" boiler. This boiler has been developed from the German "Ideal Universal" boiler on which preliminary tests were made both at Hull and at Fulham. From the drawing of this cast-iron sectional boiler given in fig. 8, it will be seen that the fuel is fed from a central magazine on to a specially

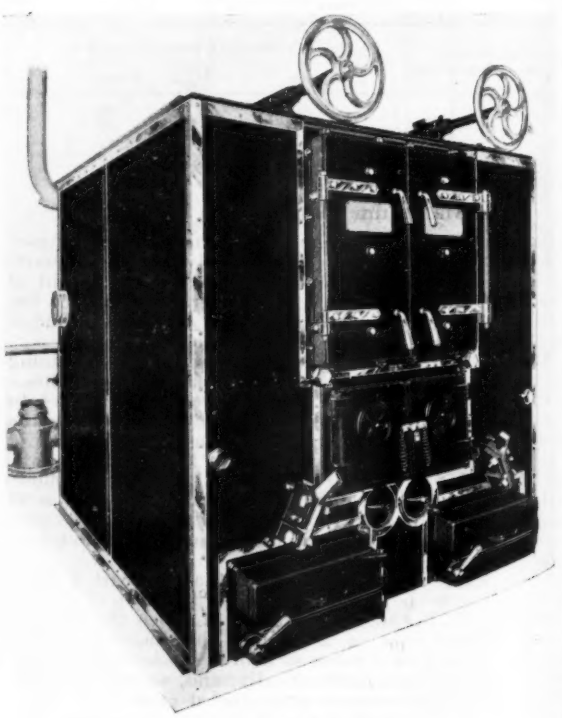


Fig. 7.

designed water-cooled grate. The advantages of this grate, the automatic de-ashing and the low resulting clinker formation which together have been responsible for the increase in the maximum combustion rate, are of considerable importance. Other special features are, first, a cut-off is fitted so that the fuel can be held in the magazine

while the fire is cleaned, and, secondly, additional fuel storage can be obtained by providing either a hopper built on to that already in the boiler or by increasing the width between the right and left hand sections of the boiler.

Coke as a Fuel for Central Heating.

At the beginning of this Paper the boiler requirements for a modern heating installation were outlined. It has been shown that when used in a gravity feed boiler, coke is capable of a degree of control and flexibility which will fulfil these requirements, while the thermal efficiency obtained compares favourably with that of competitive fuels. The quality of coke itself has been improved by the reduction in ash and moisture content, which has taken place during the last few years. Records show that for the five years 1928 to 1933 the ash content of ungraded coke has fallen from 11·4% to 9·7%, while in the same period the moisture content of large coke has fallen from 5·7% to 3·1%, and of broken coke from 11·9% to 5·8%.

I wish to express my thanks to the Governor and Directors of the Gas Light and Coke Company for permission to publish this Paper, and to Mr. H. Hollings for his criticism and advice.

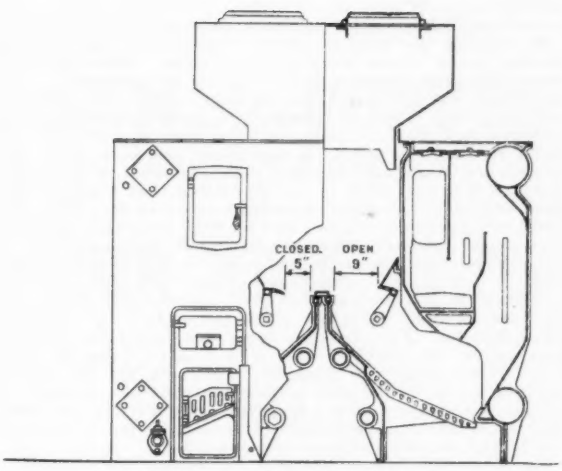


Fig. 8.—"Ideal Magazine" Boiler.

Lea Bridge District Gas Company

Annual General Meeting

The Annual Ordinary General Meeting of the Lea Bridge District Gas Company was held at the Offices of the Company, 63 and 64, Chancery Lane, W.C. 2, on Tuesday, March 12, 1935—Mr. ARTHUR M. PADDON, M.Inst.C.E. (Chairman of Directors), presiding.

The SECRETARY (Mr. Norman H. Davies, A.C.A.) read the notice convening the meeting, and the report and accounts were taken **as read.**

THE CHAIRMAN'S ADDRESS.

The CHAIRMAN said that the accounts were tolerably self-evident as being satisfactory. The report stated that they were on the right side as regards the output of gas, which, indeed, recorded a small increase. This, in itself, was a favourable feature in the general situation, because many undertakings had to show decreases. The report also showed that they had issued £25,000 4% perpetual debenture stock during the year, and also that they had lost the services of Mr. R. E. Gisburne, who had been an Auditor of the Company for many years and for whom the Directors held great personal regard as well as high professional esteem. Mr. T. W. Baird had replaced him, and all requirements were fully satisfied by the appointment.

Turning to the accounts, the Chairman said that the first statement simply showed that they had unexploited capital powers beyond anything they would need in the immediate future. The capital account was rather interesting in connection with the increase in output to which he had referred. They had only spent just over £12,000 on this account, which was reduced by £9,000 on account of depreciation, while new business to the extent of some 25 million c.ft. of gas sold had been obtained. This increase was therefore obtained at the rate of £131 of capital expended per million, and the net result was to reduce the total capital per million from £490 to £487. This spoke a great deal to those conversant with gas undertakings' accounts.

On the debit side of the revenue account, as was anticipated, they had spent £4,500 more on raw materials. Repairs and maintenance of works and plant cost £2,400 less and yet stood at the substantial figure of nearly 7d. per thousand c.ft., while the total repairs and maintenance charges were under 18d. per thousand, which, taking into consideration the type and condition of their works, was a very ample provision indeed. Stoves and fittings had cost £4,722 more, which was largely occasioned by that process which it was incumbent upon them to follow—namely, the purchase of those types of apparatus required to meet modern demands. People liked coloured cookers and fires and were not satisfied with what they were satisfied with twenty years ago. While the Company were fully ready to meet them, it made it a little heavy on revenue to effect the transformations they desired. It would, however, bring back increased business in the long run.

On the other side of the revenue account, gas sales brought in £1,116 more, but by reason of the reduction in rentals of stoves, meters, and fittings—taking the whole three items into consideration—they were £139 down. Residuals, on the other hand, told a much more flattering tale, as they had received just under £5,000 more from these sources during the year, making the total receipts £4,812 more. Expenditure had gone up by £6,000, and the profit was about £1,000 less, but was, nevertheless, very ample for all their requirements, as would be seen on reference to the profit and loss account.

Special Pension Fund Contribution.

Here there was a very important figure—as figures went—in the special contribution of £20,000 they were making to the contributory pensions fund out of undivided profits. This was not only a big entry, but it had a special value, as it took money from where it was serving no immediate purpose and devoted it to the liquidation of a definite obligation on their part—as disclosed by the actuarial valuation of their pensions fund. This left £22,335 still in the way of Carry Forward, which was quite as large as they could possibly require in the form which provided them with working capital.

For some time past they had been perilously near the limit which they were allowed in regard to undivided profits, and this appropriation brought it back to a normal figure.

The reserve fund was not only maintained at its full dimensions, but it was also almost entirely invested outside the Company, and represented approximately two-and-a-half times the annual dividend—which was more satisfactory than could be usually recorded in regard to this fund. The special purposes fund stood at £32,341, of which they had invested over £25,000. Actually there was no particular obligation to invest this fund in connection with a company of this description, which was not likely to have recourse to a fund of this nature.

Their investments had a book value of £82,752—invested outside the Company—and, taking their value at Dec. 31 last, they represented a much larger figure of £116,270. But they must take this question of appreciation of values with some caution, because it was getting to an almost exaggerated amount on some investments, and during the last few months there had been some setback. But regardless of any question of appreciation, it would be seen that they had large investments that were quite gilt-edged, outside the Company, for an undertaking of this size.

The figure of hire purchase told them how this new commercial method had seized upon the imagination of the public; and they had no choice but to respond. The system was not as precarious as one might imagine. If anyone would suffer as a result of hire purchase it would be an undertaking of this nature, operating as it did in what he might call a less opulent type of district. But they had experienced nothing to lead them to the impression that they had taken any undue risk—so they could only conform to it.

Stoves on hire, at £24,000, represented a very heavily written down value.

Co-Partnership.

The co-partnership fund stood at nearly £30,000, and was associated with the co-partners' contributory pension fund. As time went on the practical value of co-partnership disclosed itself more fully each year; but he must say that there was co-partnership *and* co-partnership, and if he had a preference for any particular system it was for their own. Sometimes co-partnership systems, upon examination, did not incorporate the fundamental principle of partnership. But with theirs they did get the full fruition of the spirit of co-partnership without any

qualifications. It grew in strength and sincerity, and its value to the Undertaking, in his judgment, became greater each year.

As regards the future, nothing looked very nice on the horizon to-day, either political or otherwise. What they were struggling against was a reduced power to purchase. Politicians did not approach it in this way. After a few babbling platitudes they spoke of industrial blizzards and international complications; but the fact remained that this country was taxed to the very limit. A statement had been made that this country's taxation was 50% more than that of the United States of America; while it was also stated that America's taxation was 150% more than any other country in the world. The result was England was taxed by over 200% more than her European neighbours with whom she had to do business. This decreased spending power. It was futile to talk about over-production, because this would not exist if there were means to purchase. It was over-taxation of the country they were suffering from. People would not go to the root of the matter of unemployment. They spoke of it as something they could not help—as an Act of God. But it was largely due to Trade Union interference with business. One could not get employment to spread to industry when there was no security for a man to invest his money. Co-partnership was the one thing that would really prevent industrial unrest by the stabilization of relations between employer and employed.

The CHAIRMAN then moved that the report and accounts be received and adopted and entered on the minutes.

This was seconded by the DEPUTY-CHAIRMAN (Mr. G. W. Carey), and there being no response to the Chairman's invitation to the shareholders to discuss the matter, the resolution was put to the meeting and carried unanimously.

Dividends.

On the proposition of the CHAIRMAN, seconded by Mr. S. H. JONES, M.Inst.C.E., dividends were declared at the following rates:

5 % per annum on the 5% preference stock;
6 ,, ,, ,, 6 ,, ,, ,, ; and
8½ ,, ,, ,, consolidated ordinary stock,

all less income-tax, payable on March 15, 1935.

Re-Election of Director and Appointment of Auditor.

The DEPUTY-CHAIRMAN moved the re-election of Mr. Paddon as a Director of the Company, remarking that it was a resolution which he moved not only with the greatest pleasure but also with the greatest confidence. Mr. Paddon's great abilities and aptness for the post he filled were so well-known to them that he need not repeat them there. He assured them that his capabilities were by no means diminished, and those in touch with him continually appreciated his great power more and more every day. The results he had been able to put before them that day were due to his guiding hand at the helm.

Mr. A. W. OKE seconded the resolution, saying that they greatly appreciated the work Mr. Paddon did.

The resolution was carried unanimously, and, in acknowledgment, the CHAIRMAN thanked them very much for re-electing him. As the years went on he felt that there was some "deterioration" going on, but he would take this resolution as meaning that they had not detected it in him so far.

On the proposition of Mr. D. C. ROBERTS, seconded by Mr. A. E. PIERCE, Mr. T. W. Baird, F.C.A., was unanimously appointed an Auditor of the Company.

The CHAIRMAN remarked that in Mr. Baird they had a highly qualified and highly competent Auditor, who would not only look after the shareholders' interests but was also a safeguard for the Directors themselves.

Mr. T. W. BAIRD, in thanking the proprietors for his election and the kind remarks that had been made, said that it was very pleasing to be able to continue an old association, for the connection of his firm with the Company went back very many years. He appreciated their compliment.

Vote of Thanks.

The CHAIRMAN then moved a vote of thanks to the Officers of the Company. Every detail of the accounts, he said, supported any such motion as this. The past year had been full of difficulty, and the road which lay before them was not free from it. They were faced with intense competition—not only from electricity but also from oil and various other forms of fuel. Taken altogether the record of the Officers deserved every recognition on their part, and they would wish to associate with this the staff and workmen, because it was the practical realization of co-partnership which enabled them to surmount the numerous difficulties as they arose.

The DEPUTY-CHAIRMAN seconded the vote of thanks, which was unanimously accorded.

Mr. D. C. CROSS, M.Inst.C.E. (Engineer and Manager), thanked them very sincerely on behalf of the staff and employees for the kind vote of thanks—which he would have great pleasure in conveying to the co-partners. He mentioned that they had now a ready means of getting in touch with their co-partners, as they had recently started a Co-partnership Magazine. They all appreciated the difficulties which lay ahead of

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them, but they were really supported and guided by the tremendous help they received from the Directors.

Mr. N. H. DAVIES also responded and endorsed all that Mr. Cross had said.

A hearty vote of thanks was accorded to the Chairman and Directors of the Company on the proposition of Mr. E. A. PIERCE, seconded by Mr. L. TREWBY.

The CHAIRMAN, in acknowledgment, remarked that, apart from any other considerations, their intense interest in their duties would carry them on; and they only hoped that in twelve months' time they would be able to present very favourable accounts—and he saw no reason why they should not.

The meeting then terminated.

Newcastle-under-Lyme Corporation Applies for Special Order

Proposals for the extension of the Newcastle Gas-Works were the subject of an inquiry held by Mr. James F. Ronca, Director of Gas Administration to the Board of Trade, at Newcastle-under-Lyne Town Hall on March 8.

The application of the Newcastle-under-Lyme Corporation was for an Order authorizing the Corporation to supply gas in the part of the Borough formerly included in Audley Urban District, and authorizing the purchase of land to construct and maintain gas-works and to manufacture and store gas and residual and manufactured products, and to authorize the Corporation to borrow money for these purposes.

The Town Clerk (Mr. J. Griffith), the Assistant Solicitor (Mr. W. Harding), and the Newcastle Gas-Works Manager (Mr. F. L. Wimhurst) attended in support of the application, objectors present being Mr. Bertram Warwick Taylor, of Clayton Road, Newcastle, and Mrs. Rawlins. The Deputy-Mayor (Alderman R. Beresford), who is Chairman of the Gas Committee of the Town Council, was present.

The Town Clerk explained that the Borough had recently been extended, with the result that they now had two gas-works which, under the Order, were to be amalgamated. Shortly after the extension of the Borough, the future policy of the Council in regard to the Gas Undertaking was discussed, and Mr. Arthur Valon was consulted. It was in accordance with his report that the present application was made. In his report, dated Sept. 18, 1933, Mr. Valon stated that it was impossible to contemplate the abandonment of the Newcastle Works, the carbonizing plant of which was thoroughly up-to-date and efficient. The works at Chesterton were on the side furthest from the closest populated areas, and extensions could be planned more easily than at Newcastle, but that was their only advantages. The site at Chesterton was liable to mining subsidence, and more gas and coke would be required to be conveyed from Chesterton to Newcastle than *vice versa*. To concentrate the manufacture of gas at Chesterton would involve a capital expenditure of £30,000 more than to do so at Newcastle, and then it would not be so convenient for the district generally.

The best policy, it was stated, would be to continue to manufacture at both gas-works at present and eventually to concentrate on manufacture at Newcastle.

In regard to gas storage, the Newcastle Works, it was urged in the report, should be increased without delay. There were at present two gasholders with a total capacity of 413,000 c.ft., and the maximum day's output last winter was 680,000 c.ft., and the output had been increasing rapidly during the past three years.

Mr. Griffith gave figures relative to the growth in the output of the Newcastle Works, and said one of the two gasholders was built in 1860 and was now totally inadequate.

The Opposition.

Mr. Griffith said notices of the application were served to over 1,000 people, but only four had entered objections. Quoting from the letter of Mr. Taylor, Mr. Griffith said his objection was that the proposed works would be detrimental to villa property in Clayton Road and to good class cottage property in Hatrell Street near to the proposed site. He suggested that the extensions should be carried out at Chesterton, where there was ample room to expand, and where the proposed gasholder would be away from residential property.

The letter from Mrs. Rawlins, also quoted by Mr. Griffith, complained that the gasholder would spoil the outlook of houses in Hatrell Street.

Mr. Griffith said the Corporation required the land for the storage of gas, and for this purpose the land, being part of the most low-lying in the Borough, was most suitable. He denied that the gasholder would be unsightly or would cause any nuisance to owners of adjoining property.

Mr. Taylor said that though the risk of mining subsidence was urged as a reason for not concentrating at Chesterton, it had not prevented the manufacture of gas from having taken place there for many years.

Mr. F. L. Wimhurst said it was proposed to erect a three-lift holder on the proposed site, with a capacity of 1,000,000 c.ft.

Mr. Ronca then proceeded to view the site and its surroundings.

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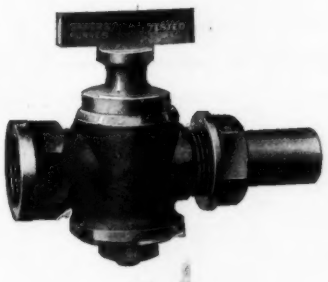

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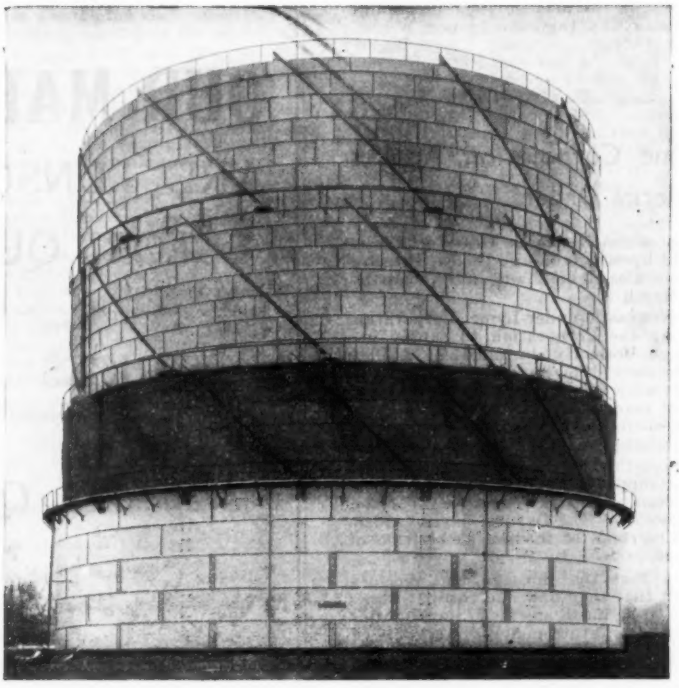

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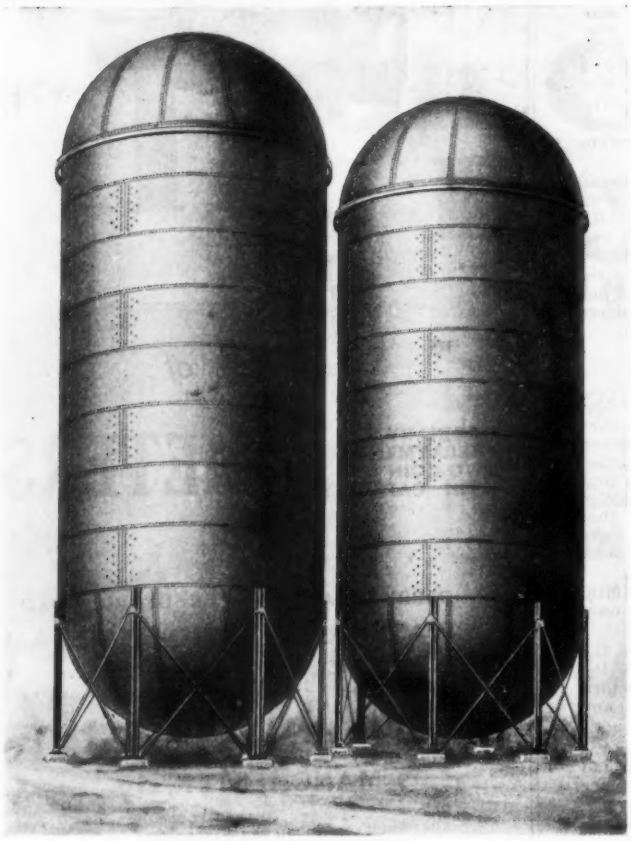

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Gas Markets and Manufactures

Stock Market Report

(For Stock and Share List, see later page)

Business for the new Account was generally small at the outset last week, but markets displayed a firm tone. There was very little speculative activity, investors confining themselves to the shares of those companies which had announced good results, especially in the "heavy" group. Later, the greater steadiness of the exchanges and the satisfactory revenue returns led to a revival of interest in the gilt-edged market, and prices showed a tendency to harden. Home rails were also brighter. At the close, however, the volume of business eased off, and a fall in commodity prices, particularly cotton, rubber, and tin, had a depressing effect on the miscellaneous market.

The Gas Market was fairly well supported, though a number of stocks not previously marked down suffered a relapse, and a few which depreciated the previous week dropped another point or two. It was noticeable towards the close that the prices of recorded transactions were in several instances the highest of the week, though the increases were not sufficient to justify any upward movement in the quotations. Dealings commenced in the Commercial new 3% debenture stock, business being done at 86½ and 87.

The South Eastern Gas Corporation has sold 200,000 4% £1 irredeemable preference shares for payment on April 1. Preference capital already issued consists of £845,016 4½% redeemable cumulative preference shares with which the new stock will rank *pari passu* for dividends. There is in addition £450,000 4% debenture stock (1958-63). It is estimated that the revenue from the Corporation's holdings is twice the amount required for the preference dividends and debenture interest. The existing 4½% preference shares stand at 22s. 6d. *ex* div., thus giving a clear 4% yield.

The Directors of the Severn Valley Gas Corporation announce that their recent offer to the shareholders of the Tenbury Union Gas Company has been accepted by holders of over 95% of the shares of the latter undertaking.

Current Sales of Gas Products

The London Market for Tar Products.

LONDON, *March* 18.

There are a few alterations to report in the prices of tar products, which are as follows:

Pitch, 40s. to 42s. 6d. per ton f.o.b.

Creosote, 5¼d. to 5½d.

Refined tar, 4d. per gallon in bulk at makers' works.

Pure toluole, 2s. 1d. to 2s. 3d.; pure benzole, 1s. 7d. to 1s. 8d.; 96/160 solvent naphtha, 1s. 5d.; and 90/160 pyridine, about 5s. 9d.; all per gallon naked at makers' works.

Tar Products in the Provinces.

March 18.

The average prices of gas-works products during the week were: Gas-works tar, 20s. to 25s. Pitch—East Coast, 40s. to 41s. 6d. f.o.b. West Coast—Manchester, Liverpool, Clyde, 40s. to 41s. 6d.* Toluole, naked, North, 1s. 8d. to 1s. 9d. Coal-tar crude naphtha, in bulk, North, 6½d. to 6¾d. Solvent naphtha, naked, North, 1s. 4½d. to 1s. 4¾d. Heavy naphtha, North, 9¾d. to 10¾d. Creosote, *ex* works, in bulk, North, liquid and salty, 4¾d. to 4⅝d.; low gravity, 4⅝d. to 4½d.; Scotland, 4⅝d. to 4½d. Heavy oils, in bulk, North, 4d. to 4¼d. Carbolic acid, 60's, 1s. 9d. to 1s. 10d. Naphthalene, £10 to £11. Salts, 55s. to 75s., bags included. Anthracene, "A" quality, 2½d. to 3d. per minimum 40%, purely nominal; "B" quality, unsalable.

* All prices for pitch are now quoted on the basis of f.o.b. In order to arrive at the f.a.s. value at any port it will be necessary to deduct the loading costs and the tolls whatever they may be.

Tar Products in Scotland.

GLASGOW, *March* 16.

Business is very quiet, but inquiries are numerous, and on the whole makers are maintaining quotations.

Crude gas-works tar.—Actual value remains at 29s. to 31s. per ton *ex* works in bulk.

Pitch.—To-day's value is round 40s. to 42s. per ton f.o.b. Glasgow for export and 40s. per ton *ex* works in bulk for home trade.

Refined tar is quoted freely at 3d. to 3⅛d. per gallon, f.o.r. naked.

Creosote oil.—Business is difficult for want of prompt supplies. Values show a fractional increase. B.E.S.A. Specification, 4⅞d. to 5¼d. per gallon; low gravity, 4⅞d. to 5⅛d. per gallon; and neutral oil. 4¾d. to 5d. per gallon; all f.o.r. in bulk.

Cresylic acid is dull. Pale, 97/99%, 1s. 3d. to 1s. 4d. per gallon; dark, 97/99%, 1s. 1d. to 1s. 2d. per gallon; and pale, 99/100%, 1s. 4d. to 1s. 5d. per gallon; all *ex* works.

Crude naphtha is scarce and commands 4¼d. to 4¾d. per gallon, according to quality and district.

Solvent naphtha.—90/160 grade is 1s. 3d. to 1s. 4d. per gallon, and 90/190 heavy is now 10d. to 11d. per gallon

Motor benzole is on offer at round 1s. 2½d. to 1s. 3½d. per gallon in bulk *ex* works.

Pyridines.—90/160 grade is 5s. 6d. to 6s. per gallon, and 90/140 grade 6s. to 6s. 6d. per gallon

Benzole Prices.

These are considered to be the market prices for benzole at the present time:

	s.	d.		s.	d.	
Crude benzole . . .	0	8⅝	to	0	9	per gallon at works
Motor ,, . . .	1	2	,,	1	2½	,, ,, ,,
90% ,, . . .	1	3	,,	1	3½	,, ,, ,,
Pure ,, . . .	1	6¼	,,	1	7	,, ,, ,,

Contracts Advertised To-Day

Benzole Recovery Plant.
Stockton-on-Tees Gas Department. [p. 716.]

Boilers (Town Gas Fired and Waste Heat).
Middlesbrough Gas Department. [p. 718.]
Stockton-on-Tees Gas Department. [p. 716.]

Coal.
Colwyn Bay Gas Department. [p. 716.]

Condenser.
Stockton-on-Tees Gas Department. [p. 716.]

Fireclay Goods.
Southport Gas Department. [p. 718.]

General Stores, Oils, Tools, &c.
Dewsbury Corporation. [p. 716.]
Southport Gas Department. [p. 718.]

Governor, Valves, &c.
Pontypridd Gas Department. [p. 716.]

Lighting Goods.
Southport Gas Department. [p. 718.]

Meters.
Dewsbury Corporation. [p. 716.]
Southport Gas Department. [p. 718.]

Paints.
Southport Gas Department. [p. 718.]

Pipes.
Dewsbury Corporation. [p. 716.]
Pontypridd Gas Department. [p. 716.]
Southport Gas Department. [p. 718.]

Trade Notes

Information on Aluminium.

We have received further leaflets from the British Aluminium Company, Ltd., Adelaide House, King William Street, E.C. 4, dealing with the finishing, welding and soldering, and machining and forging of aluminium. We are already indebted to the British Aluminium Company for other leaflets in this series which will be of great use to all users of the metal.

"Modern Lime Burning Plant."

We are indebted to Messrs. Ashmore, Benson, Pease, & Co., Ltd., Parkfield Works, Stockton-on-Tees, England, for a copy of the new booklet, "Modern Lime Burning Plant," which they have recently produced in the name of their associated company, the Power-Gas Corporation, Ltd. The booklet gives pictorial examples and some of the work executed by the Corporation.

Refrigerator Distributors' Conference.

Electrolux, Ltd., 153-155, Regent Street, W. 1, inform us that on March 8 a conference was held at the George Hotel, Luton, for their refrigerator distributors. The object of the conference, which was attended by approximately 130 delegates, was to launch the 1935 refrigeration campaign and to introduce a new larger air-cooled cabinet which is shortly to be placed on the market.

Overseas Opportunities

Johannesburg.

H.M. Trade Commissioner at Johannesburg reports that the Johannesburg City Council are calling for tenders, to be presented in Johannesburg by March 21, 1935, for the supply of 500 lamp fittings for series street lighting. (Ref. G.Y. 14871.)

Holland.

An agent established at Bussum wishes to obtain the representation, on a commission basis, of United Kingdom manufacturers of power station, gas-works, and chemical engineering equipment. (Ref. No. 215.)

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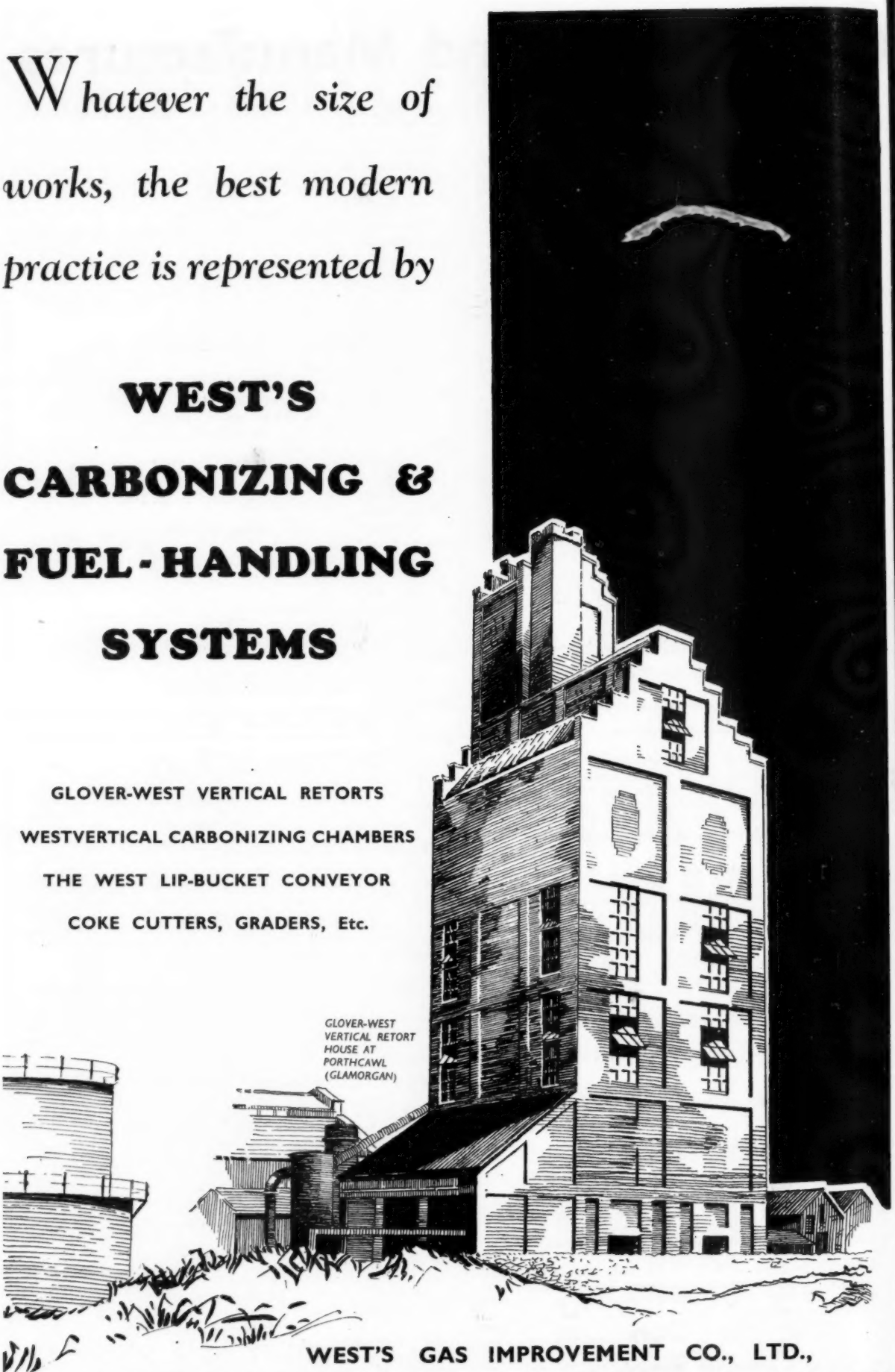

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STOCK AND SHARE LIST

Official Quotations on the London and Provincial Stock Exchanges

Issue. £	Share	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations, March 15.	Rise or Fall on Week.	Transactions, Lowest and Highest Prices During the Week.
1,551,868	Stk.	Mar. 11	7	7	Alliance & Dublin Ord. ...	132—142*	−3	128½—134½
374,000	,,	Dec. 17	4	4	Do. 4 p.c. Deb.	90—100	...	...
557,655	,,	Feb. 18	7	7	Barnet Ord. 7 p.c.	167—172	...	...
300,000	,, 1	Oct. 8	1 9/8	1/4½	Bombay, Ltd.	30 —32 -	...	30/9—31/-
178,480	Stk.	Feb. 18	9½	9½	Bournemouth sliding scale ...	220—230	...	...
550,050	,,	,,	7	7	Do. 7 p.c. max. ...	167—172	...	...
439,160	,,	,,	6	6	Do. 6 p.c. Pref. ...	147—152	...	148½
50,000	,,	Dec. 17	3	3	Do. 3 p.c. Deb. ...	86—91	...	...
262,025	,,	,,	4	4	Do. 4 p.c. Deb. ...	104—109	−3	108½
335,000	,,	,,	5	5	Do. 5 p.c. Deb. ...	127—132	−3	128
357,900	,,	Feb. 18	7½	7½	Brighton, &c., 6 p.c. Con. ...	177—182	...	...
649,955	,,	,,	6½	6½	Do. 5 p.c. Con. ...	159—164	...	...
205,500	,,	,,	6	6	Do. 6 p.c. B. Pref.	145—150	...	...
1,487,500	,,	Feb. 4	5	5	Bristol, 5 p.c. max.	119—120*a*	...	...
120,420	,,	Dec. 17	4	4	Do. 1st 4 p.c. Deb.	102—104*a*	...	...
217,870	,,	,,	4	4	Do. 2nd 4 p.c. Deb.	102—104*a*	...	...
328,790	,,	,,	5	5	Do. 5 p.c. Deb.	122—124*a*	...	...
855,000	,,	Mar. 11	7	8	British Ord.	165—170*	−8	165—165½
100,000	,,	Dec. 17	7	7	Do. 7 p.c. Pref.	160—165	...	...
120,000	,,	,,	4	4	Do. 4 p.c. Red. Deb. ...	97—102	...	...
450,000	,,	,,	5	5	Do. 5 p.c. Red. Deb. ...	111—116	...	112—114
100,000	10	22 May '33	6	4	Cape Town, Ltd.	1—3	...	...
100,000	10	6 Nov. '33	4½	4½	Do. 4½ p.c. Pref. ...	1—3	...	...
150,000	Stk.	Dec. 17	4½	4½	Do. 4½ p.c. Deb. ...	88—93	...	...
626,860	,,	Jan. 21	6	6	Cardiff Con. Ord.	130—135	...	...
237,860	,,	Dec. 17	5	5	Do. 5 p.c. Red. Deb.	105—110	...	...
157,150	,,	Feb. 4	5	6½	Chester 5 p.c. Ord.	111—116*b*	...	...
98,936	,, 1	Sept. 24	2/-	2/-	Colombo, Ltd., Ord.	1⅛—1⅞	...	36/—36/6
24,500	1	,,	1/4½	1/4½	Do. 7 p.c. Pref. ...	21/—23/-	...	21/9—22/-
609,204	1	Sept. 24	-/11·48	-/11·48	Colonial Gas Assn. Ltd. Ord.	20 6—22 6	...	21/6
296,053	1	,,	1/3·30	1/3·30	Do. 8 p.c. Pref.	25/—27/-	...	...
1,775,005	Stk.	Feb. 4	5	6	Commercial Ord.	115—120	...	...
475,000	,,	Dec. 3	3	3	Do. 3 p.c. Deb. ...	85—90	...	87
286,344	,,	Feb. 18	5	5	Do. 5 p.c. Deb. ...	123—128	...	...
807,560	,,	Feb. 18	7	7	Croydon sliding scale... ...	155—160	...	157½—158
569,590	,,	,,	5	5	Do. max. div. ...	113—118	...	114—115
620,385	,,	,,	5	5	Do. 5 p.c. Deb.	128—133	−2	...
542,270	,,	Feb. 18	7	10	Derby Con.	190—200*c*	...	...
55,000	,,	Dec. 17	4	4	Do. 4 p.c. Deb.	100—105*c*	...	...
239,000	,,	Feb. 4	5	5	East Hull Ord. 5 p.c.	111—116	...	...
181,625	,,	Feb. 4	6	6	East Surrey Ord 5 p.c. ...	131—136	...	...
175,609	,,	Dec. 17	5	5	Do. 5 p.c. Deb. ...	120—125	...	...
1,002,180	,,	Mar. 11	15	17	European, Ltd.	113—118*	−4	113½—116
19,313,481	,,	Feb. 4	5⅛	5⅛	Gas Light & Coke 4 p.c. Ord.	25/3—26 3*f*	—/3	25/3—25/9
2,600,000	,,	,,	3½	3½	Do. 3½ p.c. max.	86—91	−1	87—89
4,471,106	,,	,,	4	4	Do. 4 p.c. Con. Pref. ...	104—109	−1	104½—106½
6,102,497	,,	Dec. 3	3	3	Do. 3 p.c. Con. Deb. ...	87—92	...	89—91
3,642,770	,,	,,	5	5	Do. 5 p.c. Red. Deb. ...	115—120	...	115½—117
3,500,000	,,	,,	4½	4½	Do. 4½ p.c. Red. Deb. ...	113—118	...	114—115½
270,466	,,	,,	4½	4½	Harrogate New Cons. ...	135—140	...	139½
140,000	,, 1	Feb. 18	6	6	Hongkong & China, Ltd. ...	1⅝—1⅞	...	27/6—28/-
213,200	Stk.	Sept. 24	17⅛	17⅛	Hornsey Con. 3½ p.c.... ...	128—138	...	...
5,600,000	,,	Feb. 18	6	6	Imperial Continental Cap. ...	210—215	...	211—214
223,130	,,	Oct. 22	14	10	Do. 3½ p.c. Red. Debs.	91—96	...	94—95
285,242	,,	Jan. 21	3½	3½	Lea Bridge 5 p.c. Ord. ...	172—182	−8	177
2,167,410	,,	Feb. 18	8⅛	8⅛	Liverpool 5 p.c. Ord.... ...	136—140*b*	...	...
245,500	,,	Feb. 18	6	6	Do. 5 p.c. Red. Pref. ...	105—110*b*	...	...
306,083	,,	Dec. 17	5	5	Do. 4 p.c. Deb.	104—107*b*	...	...
165,736	,,	Jan. 16	4	4	Maidstone 5 p.c. Cap. ...	185—195	...	...
63,480	,,	Feb. 18	8	10	Do. 3 p.c. Deb. ...	83—88	...	...
75,000	,,	Dec. 17	3	3	Malta & Mediterranean ...	205—215	...	214—215
392,000	—	Dec. 3	†10	†10	Metropolitan (of Melbourne) 5½ p.c. Red. Deb.	102—107	...	...
231,978	Stk.	Oct. 1	5½	5½	M. S. Utility "C" Cons. ...	110—115	...	113
818,657	,,	Feb. 4	5	5*	Do. 4 p.c. Cons. Pref.	101—106	...	...
360,075	,,	,,	4	4	Do. 4 p.c. Deb. ...	102—107	...	...
148,955	,,	Dec. 17	4	4	Do. 5 p.c. Deb. ...	125—130	−2	...
125,000	—	,,	†5	†5	Do. 3½ p.c. Rd. Rg. Bds.	98—101	...	...
675,000	,,	Jan. 2	11/8	3½	Montevideo, Ltd.	55—65	...	...
2,061,315	,,	May 28	†6	†3	Newcastle & Gateshead Con.	24/6—25/6*df*	—/4½	...
682,856	,,	Feb. 18	5	5½	Do. 4 p.c. Pref. ...	106—107*d*	...	...
776,706	,,	,,	4	4	Do. 3½ p.c. Deb. ...	101½—102½*d*	...	...
277,285	,,	Dec. 17	3½	3½	Do. 5 p.c. Deb. '43 ...	105—107*d*	...	...
274,000	,,	Oct. 8	5	5	Newport (Mon.) 5 p.c. max....	108—110*a*	...	...
225,000	,,	Feb. 4	5	5	North Middlesex 6 p.c. Con.	172—177	...	...
396,160	,,	Feb. 18	7½	7½	Northampton 5 p.c. max. ...	105—110	...	...
300,000	,,	Feb. 4	5	5	Oriental, Ltd.	170—175	...	172½
416,617	,,	Nov. 5	†7	†9	Plym'th & Stonehouse 5 p.c.	178—183	...	...
504,416	,,	Dec. 17	8	8	Portsm'th Con. Stk. 4 p.c. Std.	180—185	...	182—185
241,446	,,	Feb. 4	8	8½	Do. 5 p.c. max. ...	110—115	...	...
114,000	,,	,,	5	5	Preston 5 p.c. Pref.	108—113	...	...
1,736,968	Stk.	Jan. 21	5	5	Sheffield Cons.	144—146*e*	...	...
95,000	,,	Feb. 18	6	6	Do. 4 p.c. Deb.	100—104*e*	...	...
133,201	,,	Jan. 7	4	4	Shrewsbury 5 p.c. Ord. ...	145—150	−5	...
90,000	10	Feb. 18	8½	5	South African	3—4	...	...
1,061,779	1	May 28	†4	†3	South East'n Gas Cn. Ld. Ord.	27/6—29/6	—/6	28/3
845,016	1	Sept. 10	1/2⅜	1,2⅜	Do. 4½ p.c. Red. Cum. Pref.	22/—23/-*	—/6	22/4½
450,000	Stk.	Mar. 11	-/10½	-/10½	Do. 4 p.c. Red. Deb. ...	100—103	...	...
6,709,895	,,	Feb. 4	7/4	4	South Met. Ord.	122—127	...	122½—126½
1,135,812	,,	Feb. 4	5	6½	Do. 6 p.c. Irred. Pf. ...	147—152	...	149—150
850,000	,,	,,	6	6	Do. 4 p.c. Irred. Pf. ...	104—109	...	...
1,895,445	,,	,,	4	4	Do. 3 p.c. Deb. ...	86—91	...	86—89½
1,000,000	,,	Dec. 17	3	3	Do. 5 p.c. Red. Deb....	113—118	—	...
209,820	,,	Jan. 7	5	5	South Shields Con.	174—176*d*	...	...
1,543,795	,,	Feb. 18	8½	8½	South Suburban Ord 5 p.c. ...	130—140	...	...
512,825	,,	Feb. 18	6	6	Do. 5 p.c. Pref. ...	120—125	−2	120—123
500,000	,,	,,	5	5	Do. 4 p.c. Pref. ...	102—107	...	107
868,837	,,	,,	4	4	Do. 5 p.c. Deb. ...	128—133	−2	...
250,000	,,	Dec. 17	5	5	Do. 4 p.c. Deb. ...	103—108	−2	...
647,740	,,	,,	4	4	Southampt'n Ord. 5 p.c. max.	113—118	...	...
121,275	,,	Feb. 4	5	5	Do. 4 p.c. Deb.	102—107	...	...
350,000	,,	Dec. 17	4	4	Swansea 5½ p.c. Red. Pref. ...	113—118	...	116—117½
200,000	,,	Feb. 4	5½	5½	Do. 6⅛ p.c. Red. Deb. ...	100—105	...	...
1,076,490	,,	Dec. 17	6½	6½	Tottenham and District Ord.	150—155	...	...
409,835	,,	Feb. 18	6⅛	6⅛	Do. 5½ p.c. Pref. ...	131—136	...	133—134
62,235	,,	,,	5½	5½	Do. 5 p.c. Pref. ...	120—125	...	124
199,005	,,	,,	5	5	Do. 4 p.c. Deb. ...	103—108	+1	...
369,774	,,	Dec. 3	4	4	Uxbridge, &c., 5 p.c.	153—158	−2	155
108,330	,,	Feb. 4	7	7	Do. 5 p.c. Pref. ...	120—125	−2	...
1,326,700	,,	,,	5	5	Wandsworth Consolidated ...	156—161	−1	158½—160
1,371,373	,,	Feb. 4	7	7	Do. 5 p.c. Pref. ...	121—126	−2	125
1,317,964	,,	,,	5	5	Do. 3 p.c. Deb. ...	127—132	−1	...
208,300	,,	Dec. 17	5	5	Do. 4 p.c. Deb. ...	104—109	...	...
158,400	,,	,,	26/8	4	Winchester W. & G. 5 p.c. Con.	116—121	...	...
	,,	Feb. 18	5	6g				

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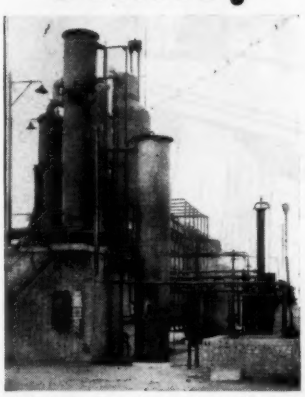

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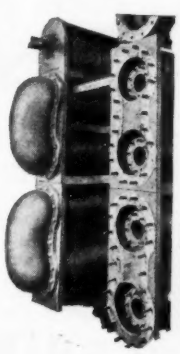

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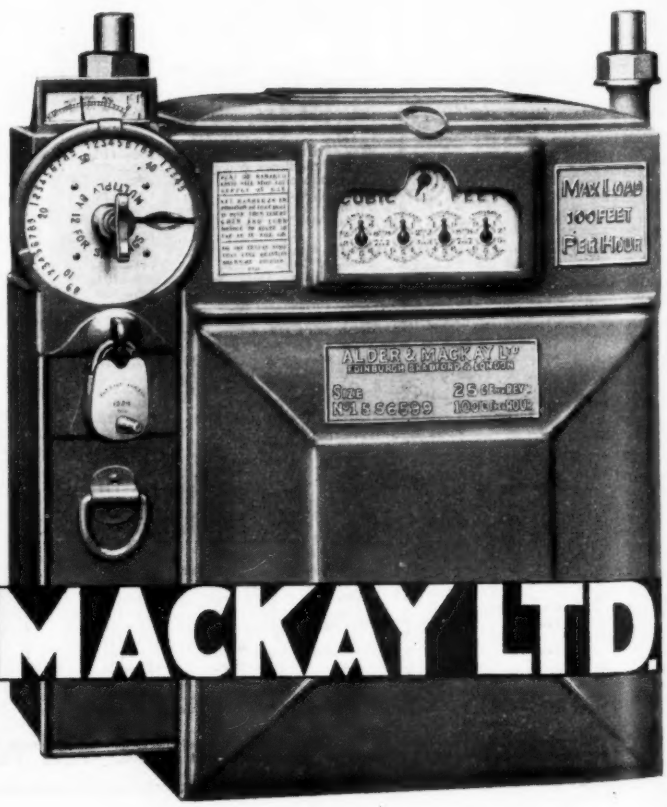

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